DIESEL PROGRESS

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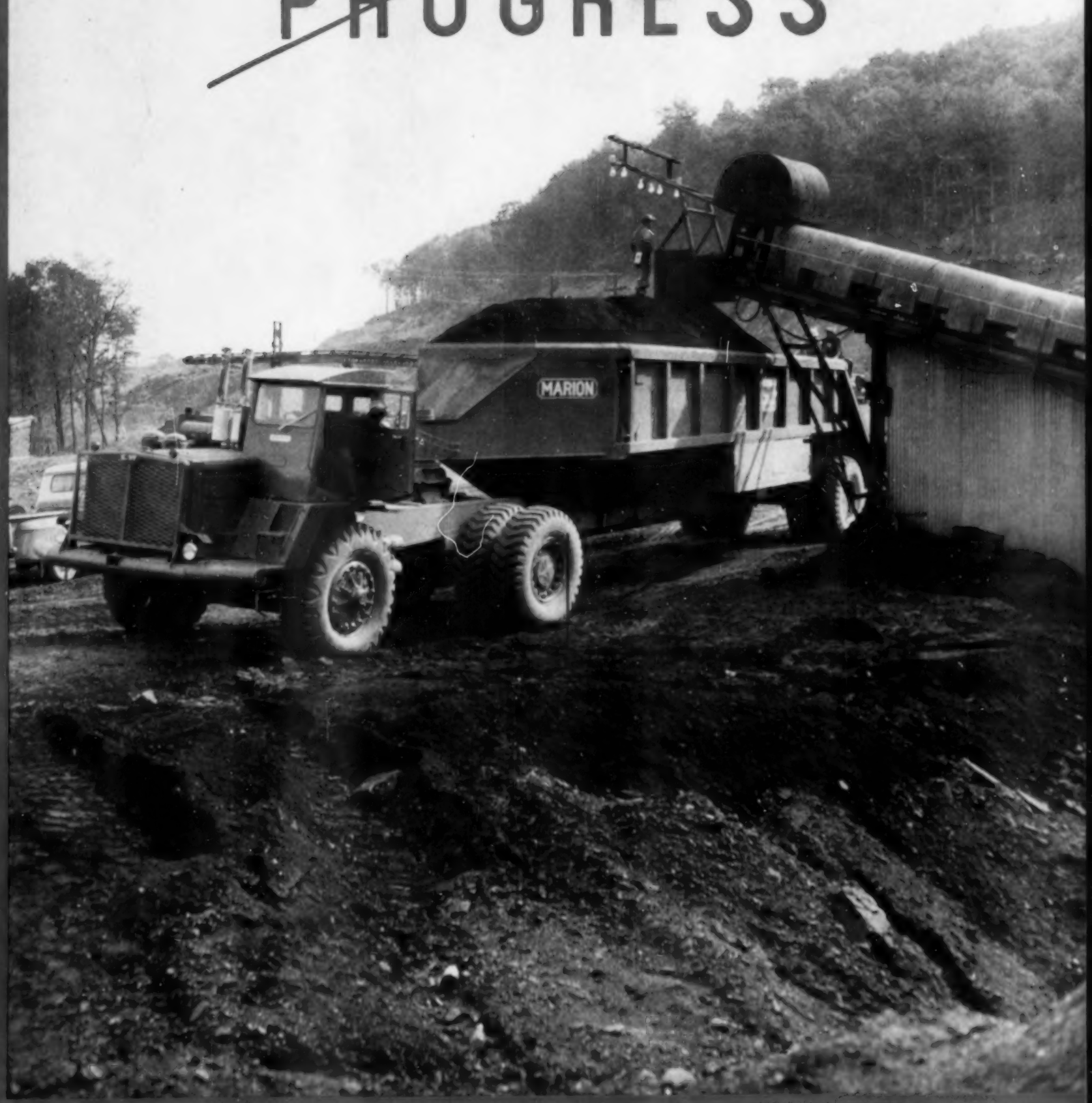

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Here's the key to engine efficiency

Free-working piston rings mean more powerful, more dependable engine performance. Lubricate with one of the famous *Texaco Ursa Oils* and rings will stay free for full-power compression and complete combustion, even under the most severe conditions.

Moreover, *Texaco Ursa Oils* resist oxidation and sludging, prevent harmful deposits, reduce wear. You'll get dependable performance from a cleaner engine, save considerably on fuel and maintenance costs.

There is a complete line of *Texaco Ursa Oils*, especially refined and processed to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls. These outstanding benefits explain why —

For over 20 years, more stationary diesel horsepower in the U.S. has been lubricated with Texaco than with any other brand.

Get full information from a Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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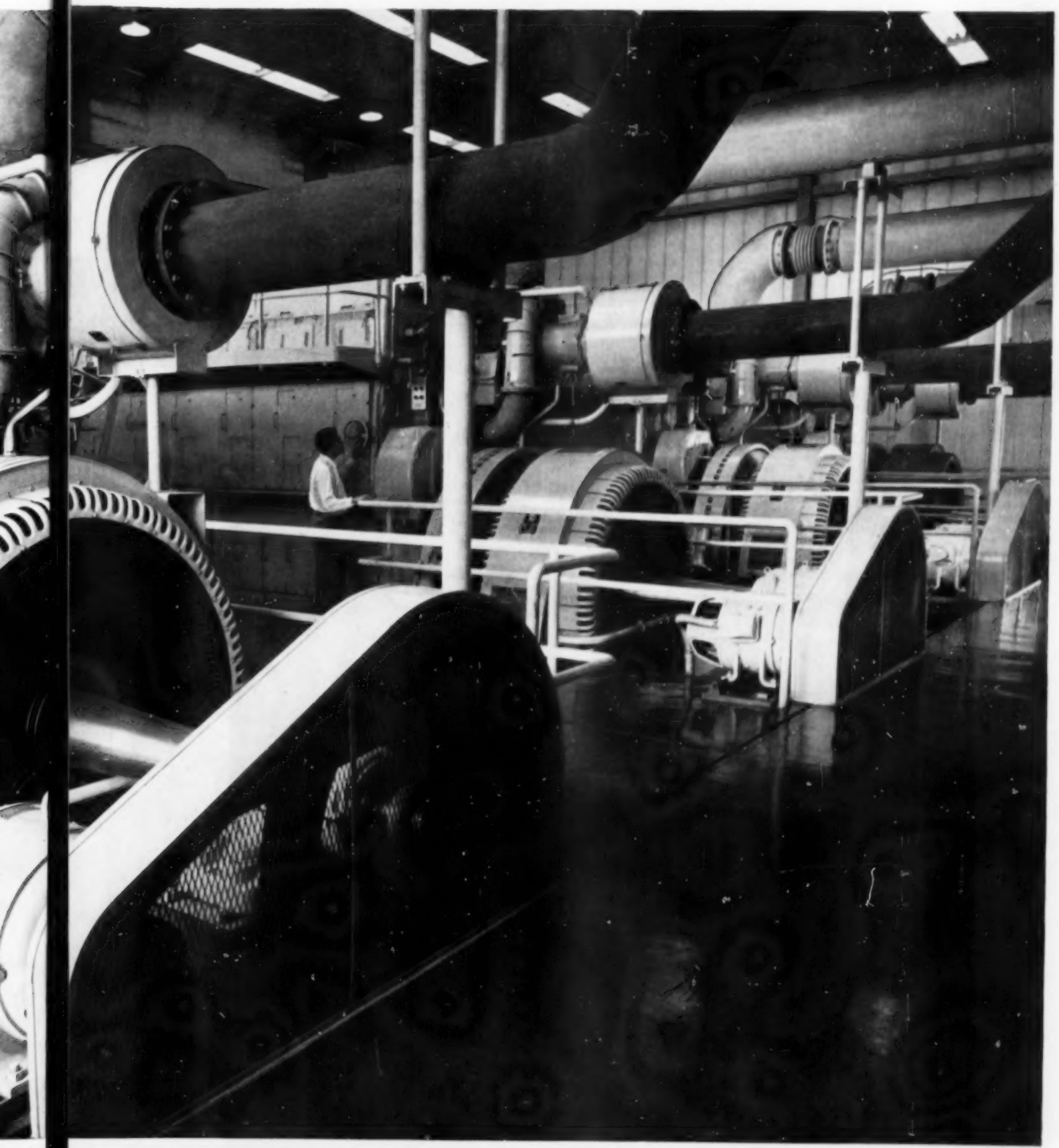

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FOR ALL DIESEL, GAS
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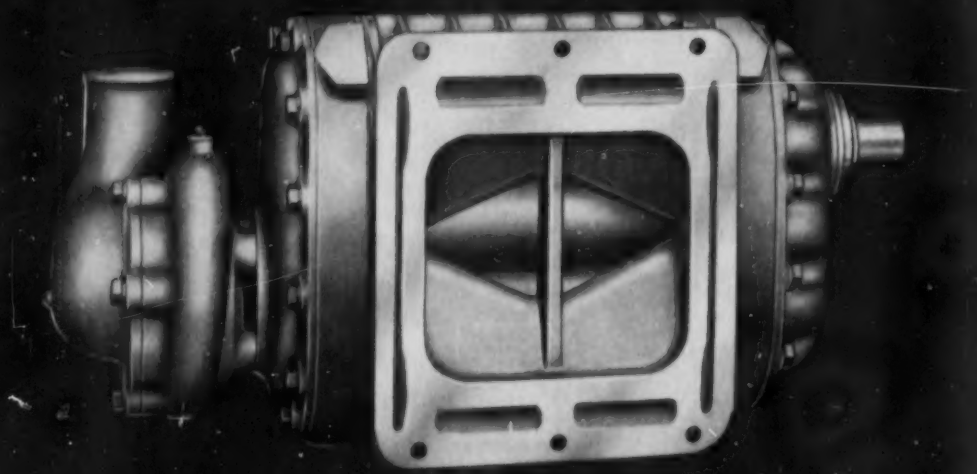

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FRONT COVER ILLUSTRATION

The mammoth Marion 95 cu yd struck bottom dump hauler trailer and Kenworth tractor powered by a 600 hp Cummins V 12 diesel, shown being loaded up in the mountainous coal fields of Beckley Coal & Coke Co. in Nicholas County, West Virginia.

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Twin Disc Torgue Converters on 14 new Darts provide full hp output, automatic downhill braking!

One of fourteen new Dart Model 25SL, 25-ton end dump trucks, built for the Reynolds Haitian Mines, Inc. Equipped with Cummins NHRBS-600 Diesel Engines, driving through Twin Disc Model CO Torque Converters and Fuller 4MS1440 4-speed Transmissions—the trucks will haul bauxite ore in Haiti.

In building fourteen new Model 25SL, 25-ton end dump trucks for Reynolds Haitian Mines, Inc., Miragoane, Haiti—the Dart Truck Company *standardized* on Twin Disc Model CO, Three-Stage, Truck-Type Torque Converters. This specifically met Reynolds' requirement for a retarding device that would eliminate use of regular service brakes on downhill runs.

TWIN DISC
Torque Converters

These new Darts will carry bauxite ore from the mines located on the plateau above Miragoane, Haiti. The average 8-mile haul (with some as long as 11 miles) is completely downhill, encountering grades varying from 0 to 11%—with an average grade of approximately 5%.

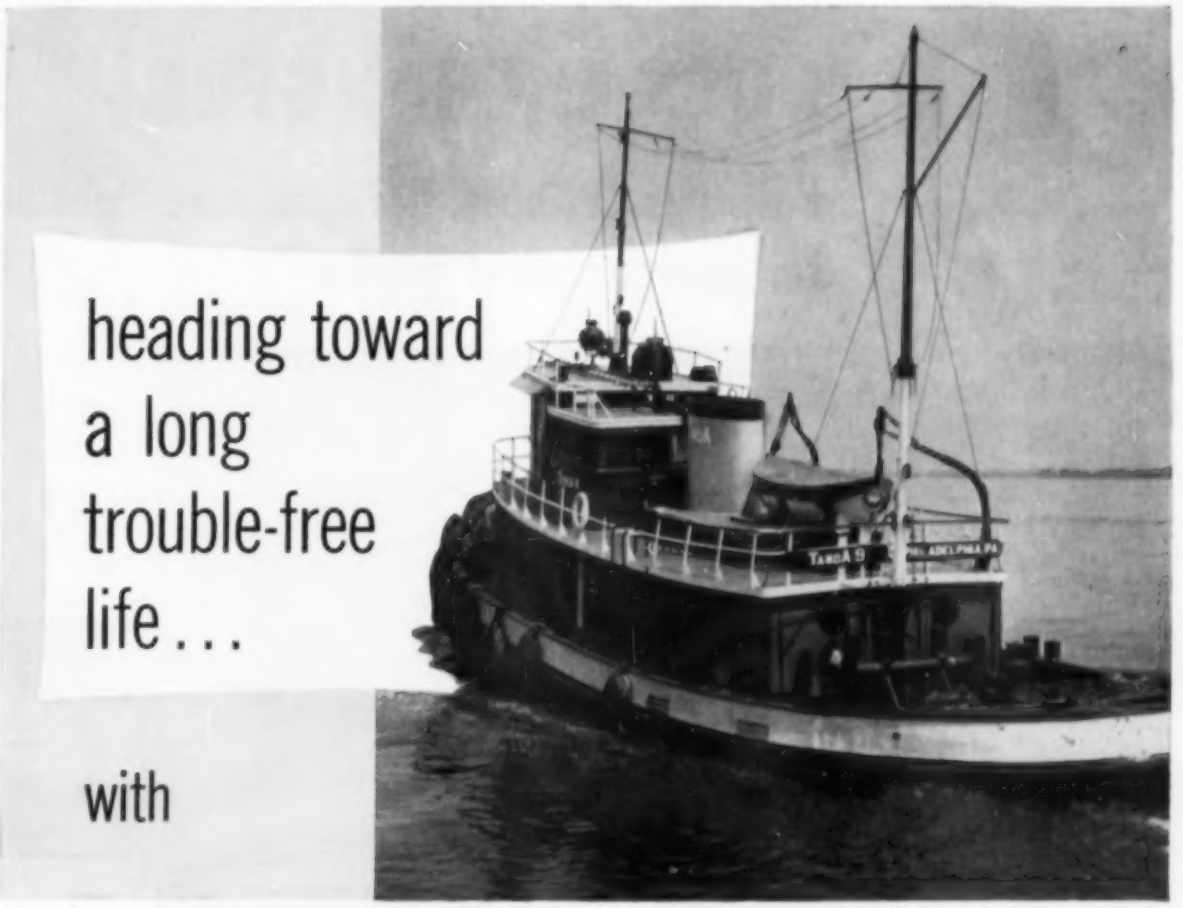
On one of three trucks already delivered to Miragoane—it has been reported that the converter, with its automatic braking, *holds the loaded (97,000 lb.) truck down to 25 mph on an 11% grade.*

Engineered specifically for operations of this kind — the Model CO multiplies torque input up to 6:1. It provides converter downhill hydrodynamic braking action automatically —whenever the accelerator pedal is retarded, by engagement of the new, heavy-duty truck-type 6" freewheel. With this special *built-in* braking feature, braking effort can actually be exerted *up to* 90% of the engine's rated horsepower.

Twin Disc also offers the Model DF Truck-Type Torque Converter, which also features Converter Braking, and Lock-out Drive for flat, straightaway runs, where fuel-saving benefits of direct mechanical drive can be utilized at high speeds.

Whatever *your* operation—short, steep hauls, or longer, straight runs—Twin Disc has a three-stage, truck-type torque converter to *exactly fit your needs.* Write for Bulletin 501-A.

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois



GULF DIESELMOTIVE and GULF DIESELECT

The powerful Atlas-Imperial Engine in this tug of the Taylor & Anderson Towing & Lighterage Company, Philadelphia, Pa., is on a true course toward dependable and economical operation with the ideal combination for workboat diesels —Gulf Dieselmotive and Gulf Dieselect.

GULF DIESELMOTIVE—the lubricating oil that has an unmatched record of low maintenance costs in this tough service. Here's why: Chosen for their ability to prevent hard carbon deposits in hot spots, the selected base stocks of Dieselmotive oil also provide an oxidation resistance safety factor. Its 100% solvent refining (which removes undesirable constituents) guarantees greater stability and more effective bearing protection. And Dieselmotive's superior additive response is obtained by carefully matching the additives to the base stocks. This insures clean rings and grooves, a minimum of piston crown deposits.

GULF DIESELECT—the straight run distillate fuel that burns evenly and completely, thus contributing further to engine cleanliness. And Gulf Dieselect has a high Cetane Index to assure good combustion at all speeds.

This combination of top quality lubricating and fuel oils can deliver more hours of operation between ring jobs, and lower maintenance costs for your fleet.

Contact your nearest Gulf office for more complete information on these quality products.

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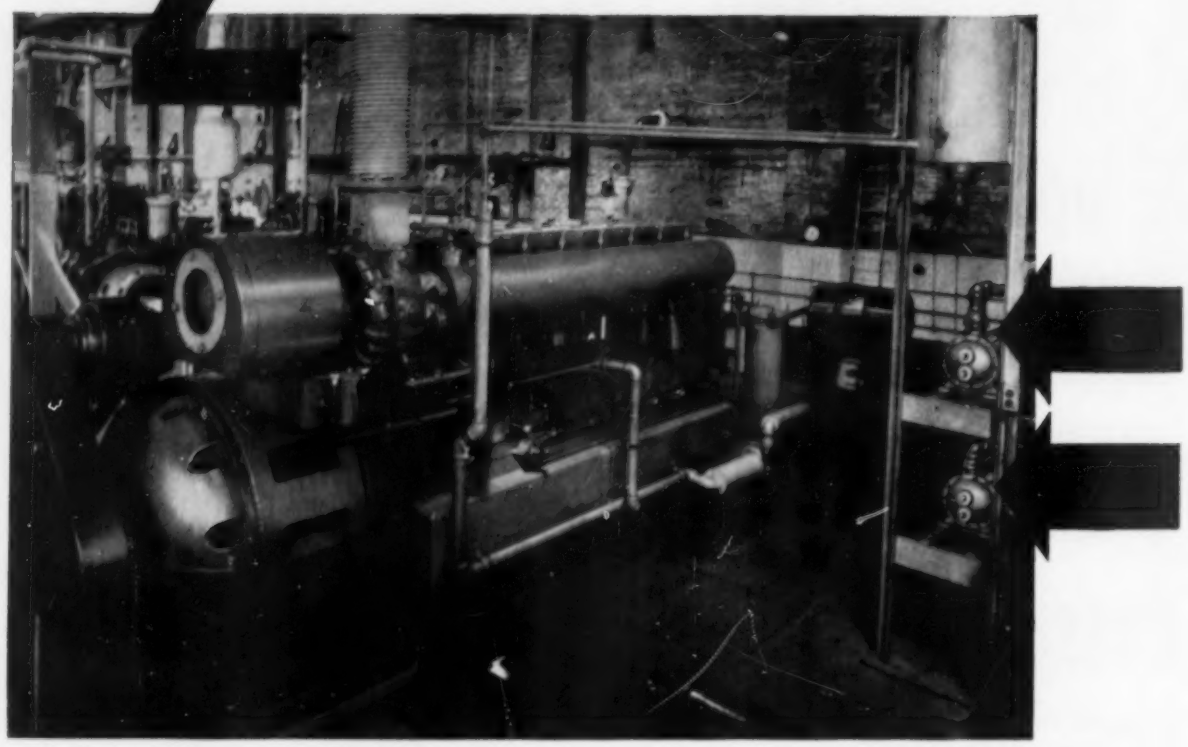
2 ROSS EXCHANGERS

keep this CP Diesel "temperature-right" for smelting plant service



On duty in a smelting plant, this CP Diesel Generator Set not only compensates for variations in furnace demands, but serves as a standby source of power in the event of boiler failure.

Safeguarding its performance are two Ross Type BCF Exchangers. Both lube oil and jacket water are dependably cooled at all times, holding engine temperatures at desired operating level.

Says Chicago Pneumatic Tool Company, "Our engineering and sales departments are fully aware of the merits of Ross Exchangers . . . installation is frequently the result of customer preference."

Throughout industry, Ross Exchangers are favored by both users and builders of numerous types of prime equipment to cool oil, water, air, gas and hydraulic fluid. Pre-engineered and fully standardized in sizes to meet a broad range of requirements, they're unsurpassed for thermal efficiency and ruggedness.

For detailed information, request Bulletin 1.1K5. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS

ROSS HEAT EXCHANGER PRODUCTS

The Engineer's Report

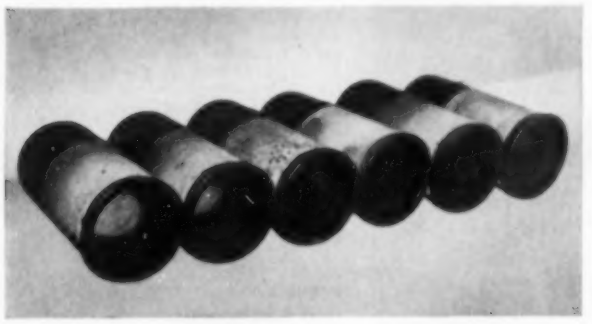
CASE HISTORY

PRODUCT *RPM Delo Oils*

FIRM *E. M. Tharp Trucking Co., Porterville, Calif.*

Only 0.0015" sleeve wear in 170,000 miles!

RPM DELO SPECIAL LUBRICATING OIL, and drivers who are trained to avoid practices that shorten engine life, keep maintenance costs to a minimum in the 16 diesel and gasoline rigs owned by E. M. Tharp Trucking Co., Porterville, Calif. Engine in truck above, pulling out with a typical 24-ton load of cottonseed, gives "good as new" performance after 140,000 miles without overhaul. Other engines give similar service in spite of much hauling up 22 miles of constant grade on the Ridge Route to Los Angeles. Sleeves below, shown just as they came from one of the engines after 170,000 miles, have only 0.0015" wear! Owner E. M. Tharp says, "RPM DELO Oils keep our engines cleaner than any oil we've ever used. And bearings stay in such good condition that we often leave them in when we overhaul."



FREE FOLDER tells you about all the RPM DELO Oils and how they meet every heavy-duty engine condition. Write or ask for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your nearest distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

How RPM DELO Oils reduce wear, corrosion, oxidation in all heavy-duty engines

A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

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THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

ON SHORTLINE AS WELL AS MAINLINE ROADS
IT'S BENDIX FUEL INJECTION

All over the country shortline railroads like those listed here are giving 'round-the-clock service that helps make the American railroad system the envy of the world.

Using 70-ton and 95-ton General Electric road switchers powered by Cooper-Bessemer engines with Bendix* Fuel Injection Equipment, these shortline roads maintain high operating standards in the performance of their important work.

Bendix is proud that its fuel injection equipment has received such high endorsement from so many shortline railroad operators.

It furnishes further evidence that when dependable, efficient, and economical operation is a must Bendix is the logical choice for fuel injection equipment. SCINTILLA DIVISION OF BENDIX AVIATION CORP., SIDNEY, N.Y. EXPORT SALES AND SERVICE: BENDIX INTERNATIONAL DIVISION, 205 EAST 42ND ST., NEW YORK, N.Y. *REG. U.S. PAT. OFF.

This Bendix pump and nozzle are used on the type of road switcher pictured above.

Partial list of shortline roads using Bendix Fuel Injection Equipment

ALBANY & NORTHERN
ARKANSAS & OZARKS
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BELFAST & MOOSEHEAD LAKE
COLORADO & WYOMING
DES MOINES & CENTRAL IOWA
EAST ERIE COMMERCIAL
FT. DODGE, DES MOINES & SOUTHERN
FRANKFORT & CINCINNATI
GEORGIA NORTHERN
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HAMPTON & BRANCHVILLE
LANCASTER & CHESTER
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Bendix
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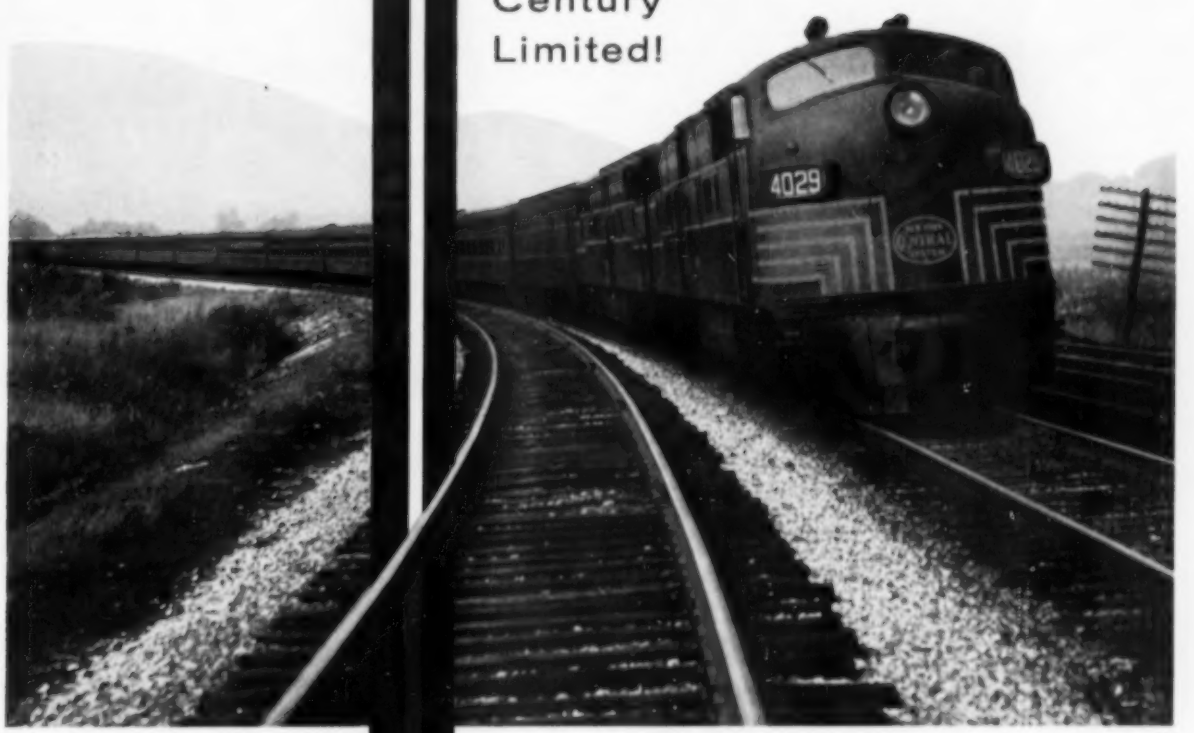
Century
Limited!



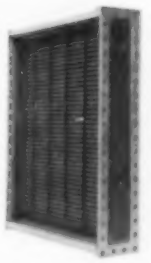
HARRISON KEEPS THE ENGINE COOL

on New York Central's crack train!

The Century takes sizzling, split-second schedules in stride! Making the blazing run from New York to the Windy City . . . this train never runs a temperature. It's prepared for peak performance with Harrison heavy-duty lube oil and jacket water coolers. Harrison coolers are durable, dependable, compact . . . designed for duty on the most advanced diesel engines. That's why the majority of today's modern locomotives specify Harrison to control the heat. If you have a cooling problem, look to Harrison for the answer.

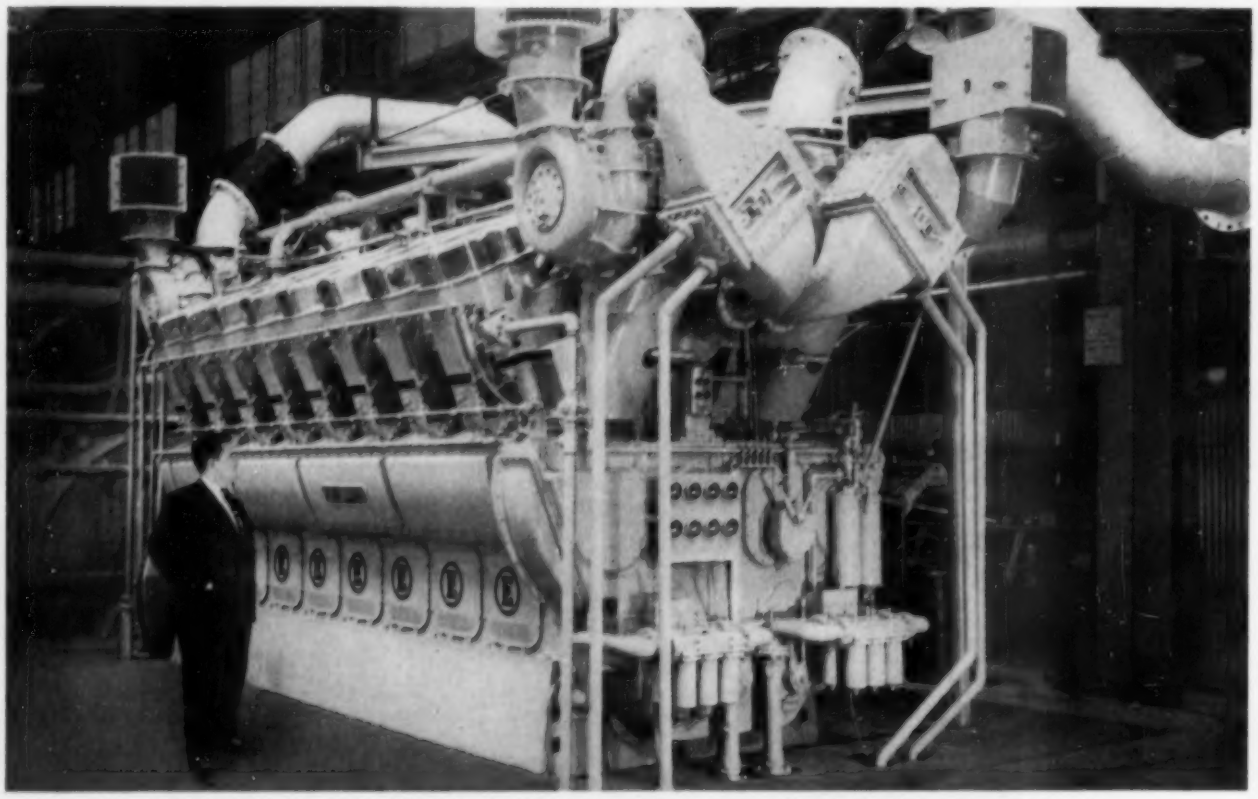
HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N. Y.

GM Watch "WIDE, WIDE WORLD" Sundays on NBC-TV



TEMPERATURES MADE TO ORDER

HARRISON



New 7,700 HP Enterprise RV is 20% shorter, 30% less weight than conventional 16-cylinder diesels of equal power.

Enterprise announces the new 16-cylinder RV diesel —World's smallest 7,700 HP engine

"It is a pleasure to present this Enterprise engine—the newest in our line of dependable diesels. The many features and economies of the Enterprise RV make it extremely attractive to users of high horsepower engines—both marine and stationary."

Arthur W. Ostrander, General Sales Manager

Here at last is a turbocharged V-type, heavy-duty engine specifically developed to produce *more* horsepower in a *smaller* unit —dependably and continuously.

For marine installations this means more payload space, greater tonnage capacity than ever before. For electric power generation in municipal or industrial plants, and as power for pumping oil, gas or water, the reduced costs of foundations, installation, operation and maintenance make the RV even more attractive to engineers and owners.

Diesel, dual fuel, tri-fuel, spark ignition

The RV can be operated as a diesel, dual fuel, tri-fuel, or spark ignited gas engine. Its low operating costs on diesel fuel can be cut even further when residual fuels are used. This is "workhorse" power at its dependable best. Thousands of continuous, uninterrupted hours without shutdown are characteristic of the RV's slow-speed operation.

Less bulk makes installation easier, servicing simpler. RV maintenance doesn't require major disassembly, either. All working parts are accessible for service from the outside. So overhaul costs are kept low and downtime is reduced to an insignificant factor.

Vital statistics of Enterprise RV:

Type: 4-cycle, 12 or 16 cylinders, 17" bore by 21" stroke

Rating: To 7,700 BHP at 400 rpm. Piston speed: 700-1,400 fpm.

Dimensions: 26'4" long, 9'4" wide, 12'1" high

Weight: (less flywheel) 189,100 lb.

Fuel: Diesel, dual fuel, tri-fuel, spark ignited gas

Enterprise welcomes your inquiries. Why not plan now to get the complete story? Call or write today, or use the handy coupon.

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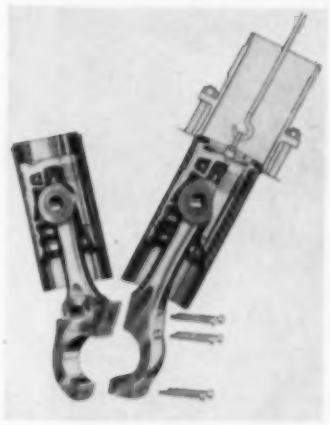
How the exclusive Enterprise turbocharged V-block design packs more heavy-duty horsepower into less space, less weight

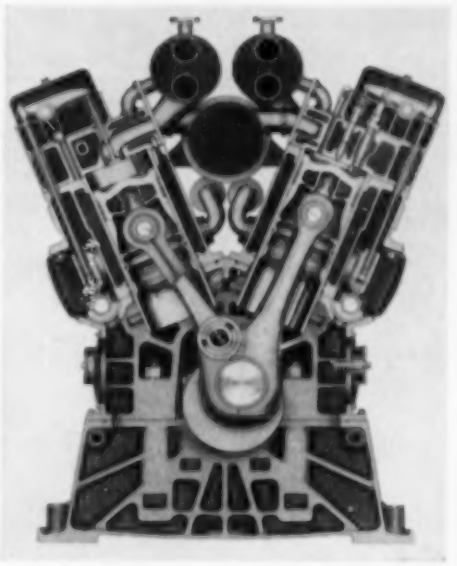


Connecting rod design cuts engine length 20%

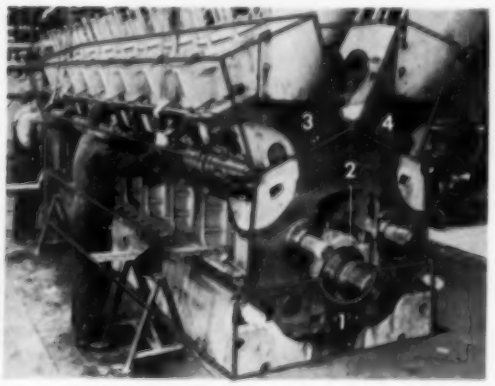
The master-and-link articulated connecting rod permits opposite cylinders in the V to lie in the same plane. Weight-to-horsepower ratio is reduced to only 25 lb. per HP — some 30% less than conventional units.

Completely accessible— easy to service

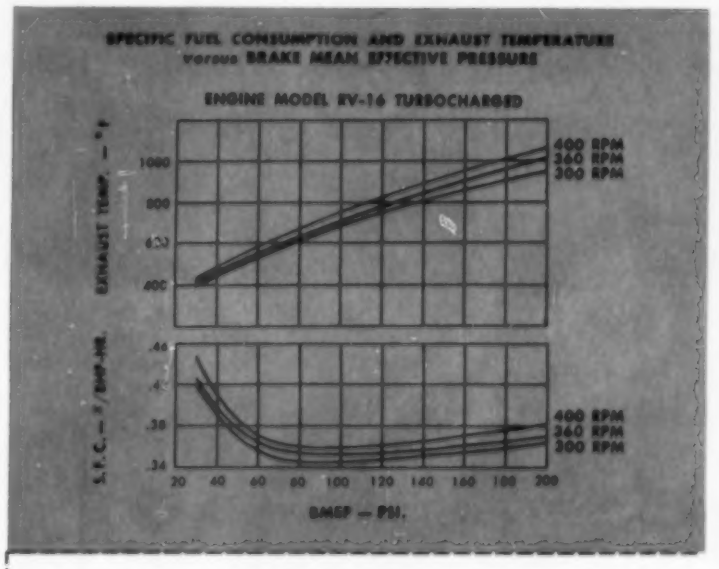
The master connecting rod features a rack-tooth joint for quick and easy removal of the entire assembly. Simply release six clamping bolts and withdraw con rod and piston through cylinder liner.



For practicality in manufacture, shipment, installation and maintenance, the RV engine frame is built in four pieces — base (1), crankcase (2) and two identical cylinder blocks (3 & 4), all of quality-controlled cast iron for maximum strength and rigidity.



The high performance standards achieved by the Enterprise RV-16 turbocharged engine are shown on the curve at right. Tests are made under standard conditions on the 10,000 HP capacity hydraulic dynamometer specially built for this new high-horsepower engine series.



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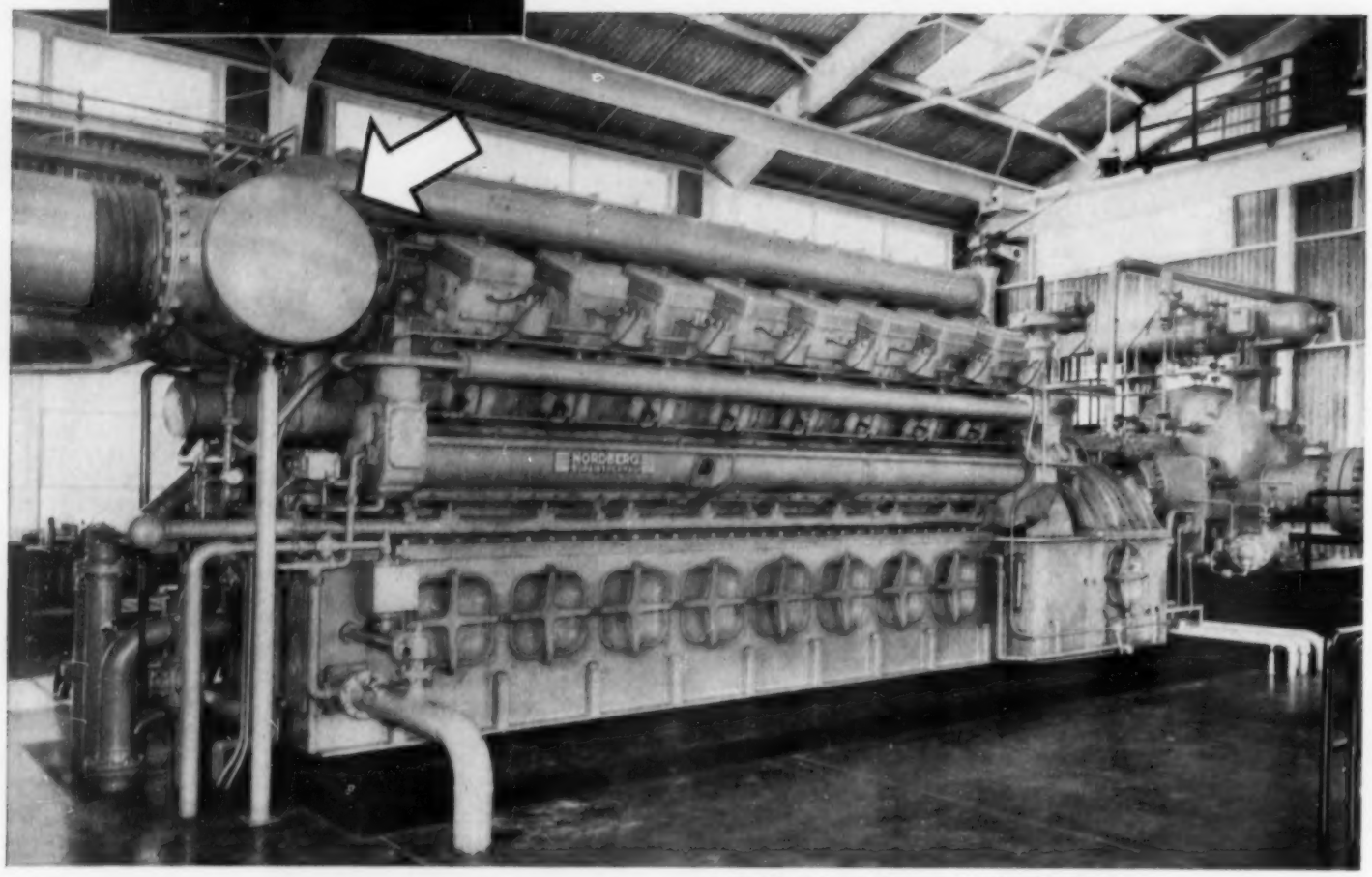
HIGH PRESSURE TURBOCHARGERS

double diesel output <u>without</u> increasing thermal loading



A Nordberg Supairthermal 3550 hp, 16-cylinder gas engine is turbocharged by a De Laval B-13 high pressure unit. This gas engine-gear set is driving a De Laval centrifugal gas pipeline compressor.

De Laval High Pressure Turbochargers utilizing a radically new design principle, can double the output of heavy-duty diesel, gas and dual-fuel engines *without increasing thermal loading.* ● As a result of the exclusive Monorotor construction, De Laval turbochargers offer pressure ratios of 3:1 as well as far higher compressor and turbine efficiencies than those found in conventional turbocharger systems. De Laval units are self-adjusting to engine loads, can be used on 4- *and* 2-cycle engines. Other Monorotor advantages are exceptional simplicity and light weight.

Write for De Laval Bulletin 8000 giving comprehensive curves and flow range diagrams.

DE LAVAL *Turbochargers*

DE LAVAL STEAM TURBINE COMPANY

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Massey GOVERNORS

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FOR ALL APPLICATIONS OF ENGINE CONTROL

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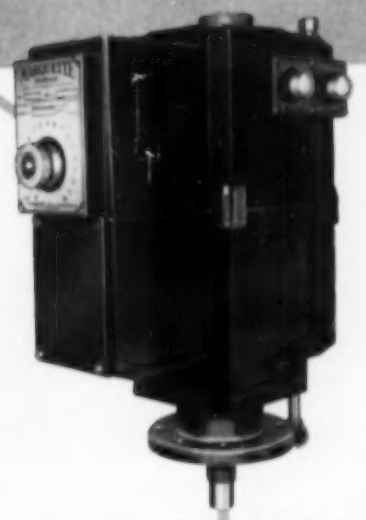
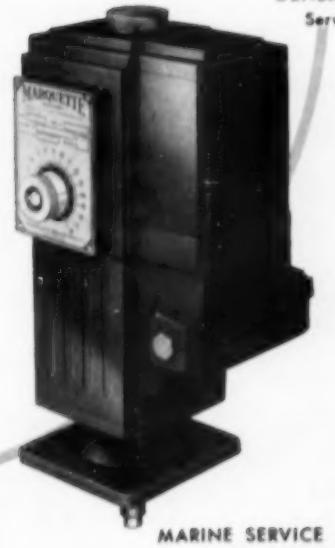
COMPRESSOR AND PUMP SERVICE
Terminal Shaft Type

OVER-SPEED SERVICE
Shut-down Type



GENERATOR SERVICE
Servomotor Type



MARINE SERVICE
Servomotor Type

District Representatives and Service Agencies of both companies are available to all customers. Our combined engineering facilities are at your disposal for all problems of governing and control.

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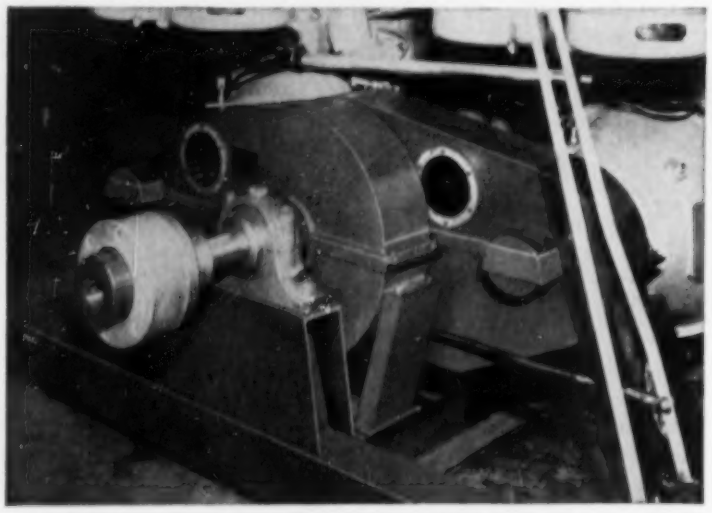
ROTARY OIL PUMPS • PRECISION PARTS AND ASSEMBLIES

Get Maximum HP Output from High-Speed Diesel Engines with Morse Hy-Vo Drives

Note the smooth action of Morse HY-VO in operation. Matched 182-HP diesel engines, operating at 1450 RPM, are twinned through HY-VO Drives to jack shaft, which operates at 650 RPM. Jack shaft delivers 364 HP to load shaft (not shown), to which it is coupled with Morse Morflex Radial Coupling (see below).



Twin HY-VO Drives are encased in sealed casings, permit continuous forced-spray and sump oil lubrication. Observation ports permit inspection. Morflex Radial Coupling cushions any shock loads from driven unit, prevents engine pulsations from entering driven shaft.

Southern Bearings Service and Lewis-Diesel Engine Company solved difficult cotton gin drive problem at low cost to customer.

Morse Hy-Vo Drives helped solve a typical power-transmission problem for Lewis-Diesel Engine Company (Memphis, Tennessee). Working with Southern Bearings Service, Inc., the local Morse distributor, they combined twin high-speed diesels with two Morse Hy-Vo drives to get low-cost, low-speed, high-horsepower output to a cotton gin main drive.

By compounding two small, high-speed diesel engines with required reduction ratios, the need for a big, expensive, low-speed engine was eliminated. Quick access to individual drive units was made possible without disturbing main compound base. Customer downtime is reduced to a minimum.

Compact Morse Hy-Vo Drives provide smooth, positive power transmission at speeds up to 8,500 fpm. They combine the positive action of gears with the favorable load distribution of chain; are rated at 20,000 hours' service life.

HY-VO Drive links, showing exclusive rocker-type joint. Rocker joint reduces wear and friction, results in coolest running chain drive.

Complete information free

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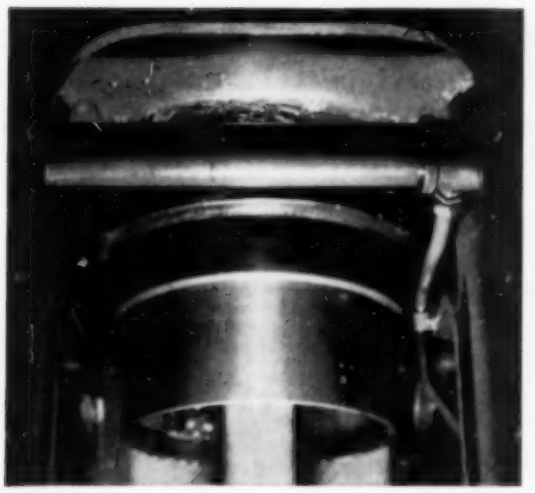
MORSE B-W *Trademark **POWER TRANSMISSION PRODUCTS**

(l. to r.) Carl Olbertz, Milford plant superintendent, "Rollie" C. Bleimehl, Standard Oil industrial lubrication specialist and Frank Morgan, Milford chief engineer inspect crankcase. Rollie Bleimehl is qualified to give technical service on jobs like this. He's been doing this sort of work for 10 years. Rollie has a mechanical engineering degree from Iowa State College and has completed the Standard Oil Sales Engineering School.

23,000 hours on original rings and bearings—no overhaul

Milford, Iowa, Light Plant gets this performance from engine using STANODIESEL Oil M



"As is" photo of piston skirt and interior of crankcase. No wiping or cleaning was done before photographing or at any time during 23,232 hours engine has been in service. STANODIESEL Oil M is the lubricant.

When a new 720 H.P. Superior engine was put in service at Milford, Iowa in 1949, the plant management knew what oil they were going to use—STANODIESEL Oil M. Their choice was based on previous experience with Standard diesel oils in other engines.

After 23,232 hours of operation, the engine at Milford is still operating with the original bearings and rings. It has not been overhauled. The crankcase, as shown in the photo, is clean. Pistons are clean and bright with no sign of wear. Twice yearly, oil samples have been taken for laboratory analysis. Each time the analysis has shown the oil to be in perfect condition. Good maintenance and STANODIESEL Oil M have contributed to this performance.

Got a hard job for an oil? STANODIESEL Oil M can do it. STANODIESEL Oil M has superior stability. Its additive formula helps to (1) prevent oil viscosity build-up (2) keep crankcase, pistons, cylinder walls and other parts clean (3) control foam (4) maintain film on difficult to lubricate areas and parts.

There's a Standard Oil industrial lubrication specialist near you in any of the 15 Midwest or Rocky Mountain States. Call him for more information about STANODIESEL Oil M. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Quick facts about
STANODIESEL Oil M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by use of economy fuels.
- Maintains film on difficult to lubricate areas and parts.
- Eliminates spark plug fouling in spark ignited engines and reduces combustion chamber ash deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil commingle.

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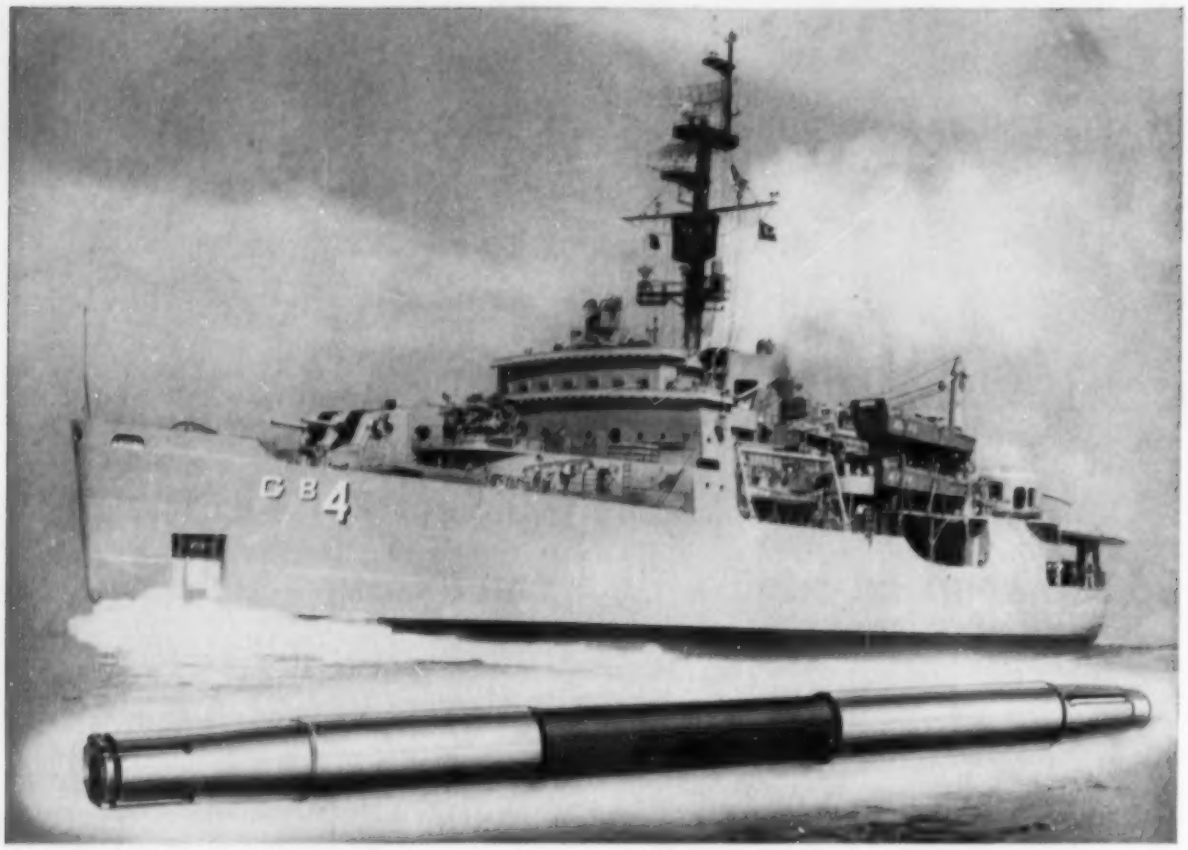

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COURTESY OF THE INGALLS SHIPBUILDING CORPORATION

HORSEPOWER GOES TO SEA —

Another Erie Shaft Drives this Navy Ice Breaker

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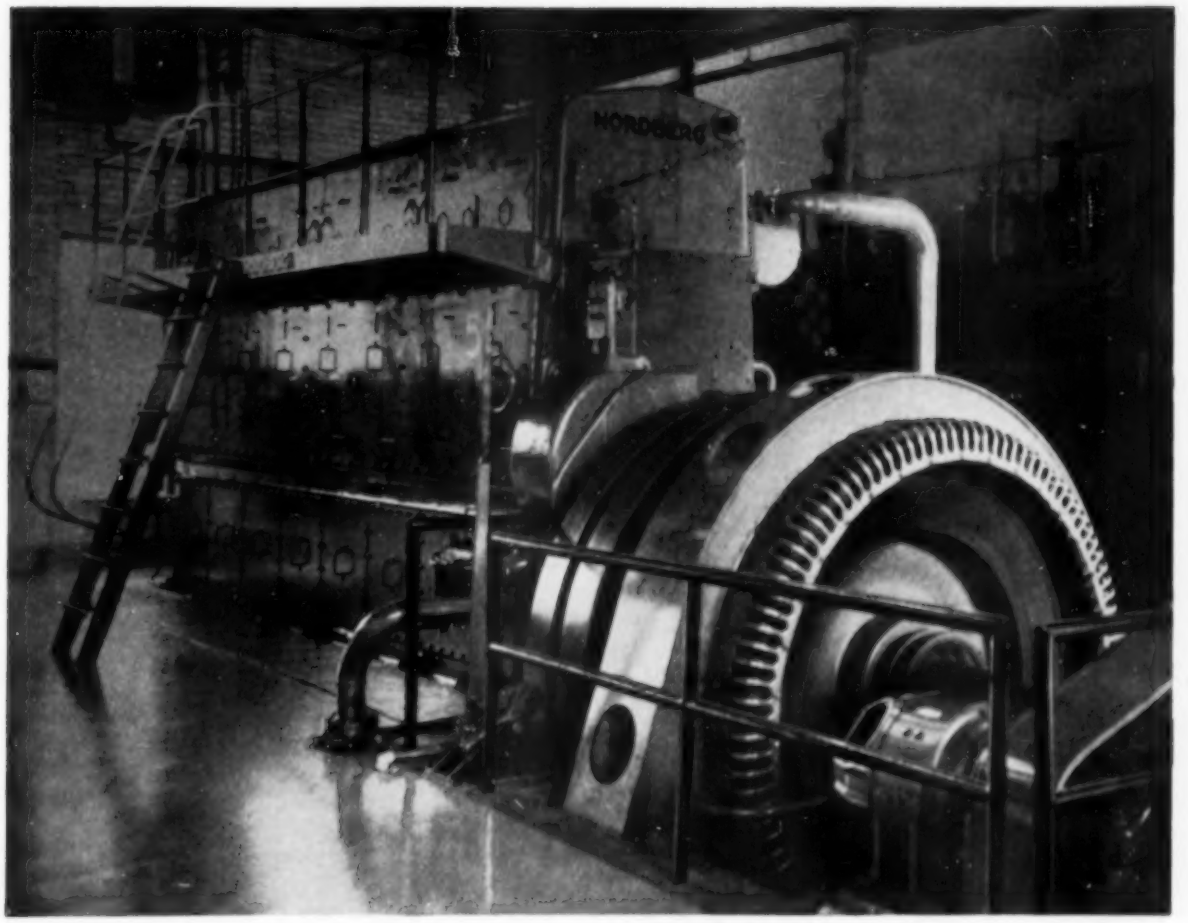

After 30,000 hours Koppers Piston Rings still maintain "excellent" compression

At the Neodesha Municipal Power Plant, Neodesha, Kansas, Koppers Piston Rings are an important part of the 1750 bhp. Nordberg Duafuel Engine illustrated above. After 30,000 hours of operation the pistons on this engine have never been pulled, and compression is still excellent. It is interesting to note that this Nordberg Engine, equipped with Koppers Piston Rings, has been in operation over 98% of the time—and carries about 90% of the plant load.

Koppers has widely experienced engineers and extensive manufacturing facilities which combined can fill the most difficult of piston ring requirements. Next time you are concerned with piston rings or sealing rings, whether in replacement or new installations—in engines large or small—call on Koppers. Never any obligation, of course. For more information, mail coupon.

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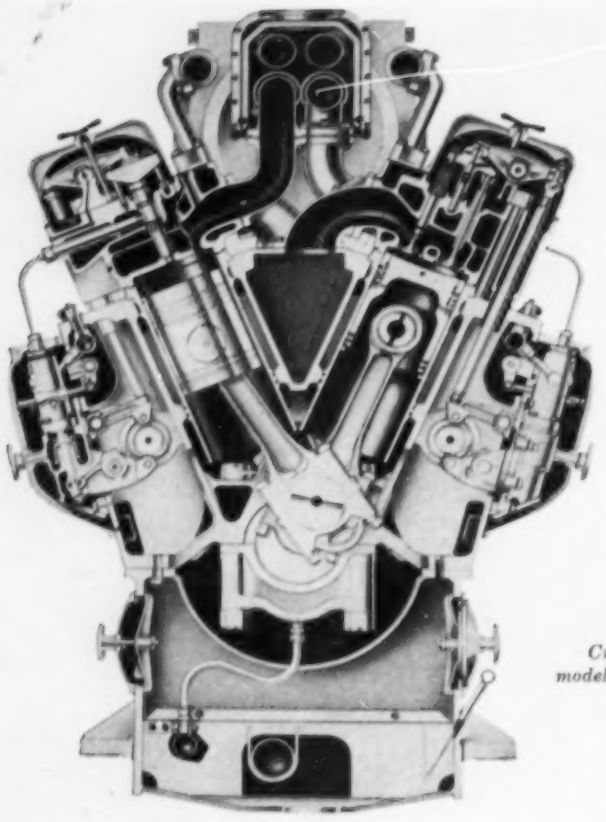

Cross section of vee model ALCO *251 diesel.*

MODERN ALCO 251 DIESELS

ARE DESIGNED FOR LIGHTER WEIGHT, HIGHER POWER, LOWER COSTS

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You get better economy. Not only in low first cost from ALCO's production line, but in low operating, installation and maintenance cost the ALCO 251 diesel can mean a real economy.

ALCO 251 DIESEL ENGINE SPECIFICATIONS

No. Cyl.	Bore and Stroke (in)	RPM Range	BHP Range	Approx. Wt. Dry (lb)
6	9x10½	350-1000	550- 900	22,100
12	9x10½	350-1000	1100-1800	32,650
16	9x10½	350-1000	1470-2400	42,000

For further information about these modern, high-powered, light-weight diesels, contact your nearest ALCO sales office or write P. O. Box 1065, Schenectady 1, New York, for a new brochure giving all details.

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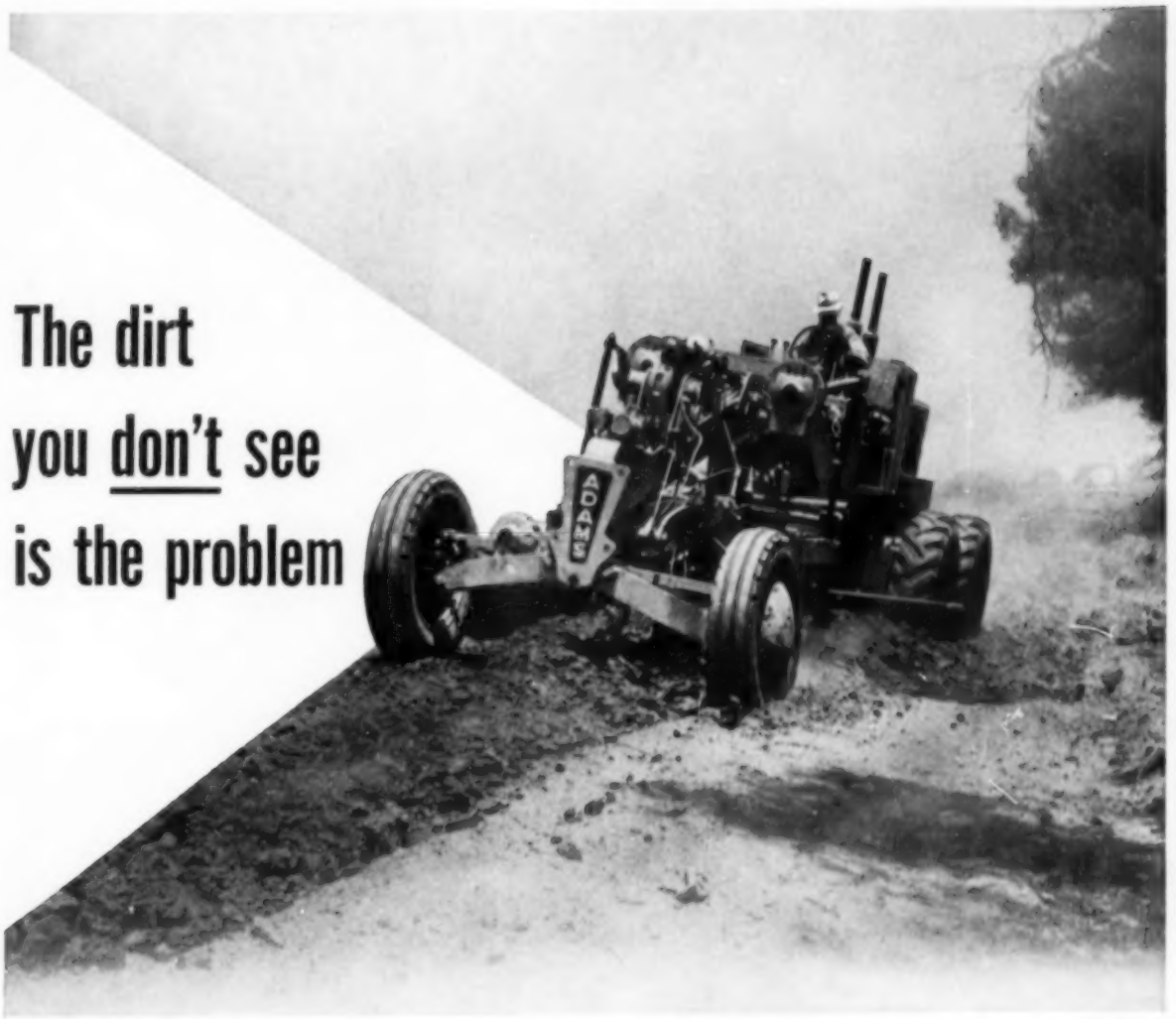

Le-Tourneau-Westinghouse Adams "660" Grader, powered by 150 H. P. Diesel Engine

Dry Type Micronic® Air Filtration solves it

The tons of dirt this grader moves in a day don't give it any trouble at all. But just let a little of the dirt that's drawn in with the air intake get through to the engine and it'll stop dead in its tracks. That's why efficient air filtration is so vital to the operation of this equipment . . . why engine and equipment manufacturers have accepted PurOlator's new Dry Type Micronic® Air Filter as the most efficient yet developed.

Whether your engine is idling or revving at top speed, this new Purolator Air Filter removes 99% of all contaminants. That makes it virtually impossible for harmful abrasives to get into the precision parts of the engine no matter how dirty the job or where you're working. The Dry Type Micronic elements save time and effort in servicing, too. Elements can be replaced in one-tenth the time — and with one-tenth the effort — needed to service other types.

Purolator Catalog AFC-56 contains a valuable chapter "Facts about engine air requirements" that can help you prolong engine life and reduce repair bills. Send for your free copy today. Address Dept. D9-1010.

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advanced design in turbochargers means... air-cooling!

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We invite your inquiry on how you can improve the performance of your diesels by the application of our turbochargers.

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS					
MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

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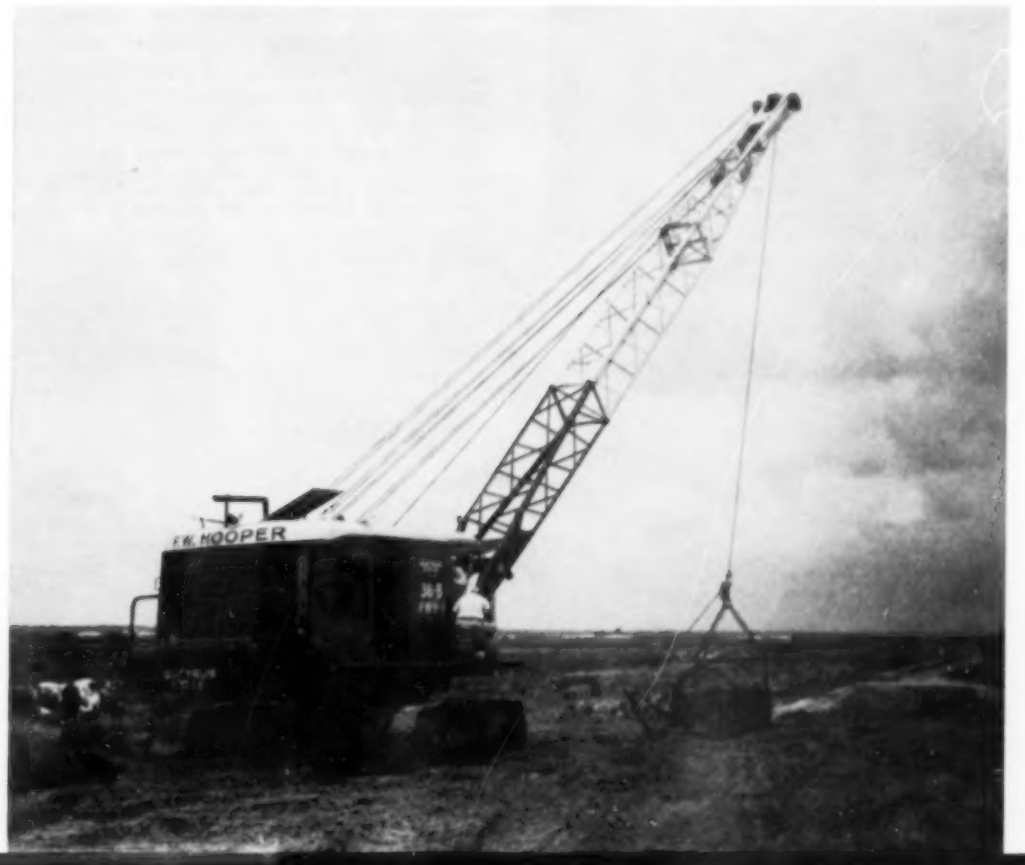
DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

SUNSHINE STATE PARKWAY

By Ed Dennis

◆ Stirling Road Bridge at West end of Seminole Indian Reservation. Bridge will carry traffic over the Turnpike. Contractor is Wiley Jackson.

◆ A Bucyrus-Erie #38B dragline with a Caterpillar diesel providing the power through a Twin Disc clutch; 3600 yards of fill is scooped out a day by this dragline reported M. J. Hall, its operator. It has a 65 ft boom and a 2½ yd bucket; F. W. Hooper was the contractor for this section.



FLORIDA'S long time dream of a modern super-highway is rapidly becoming a reality. With practically all of the contracts awarded, the 108 mile Miami to Fort Pierce, bob-tail turnpike will be completed at a cost of approximately $470,000 a mile. Other major turnpikes range from above this figure to many millions of dollars per mile in some extreme cases. Careful planning, plus the tremendous number of pieces of dieselized equipment being utilized, is really paying off as the parkway is expected to be opened to traffic by January 1st, 1957.

The five and a half million Florida tourists bring a billion dollars into the state each year and 71 percent of them travel by automobile. All eyes are on Florida; "Florida is solid" reports the Kiplinger Letter from Washington, "people are moving in at a rate more rapid than into any other big state. This means growth of population, business and wealth, and is good for 5 to 10 years or as far ahead as anyone can see".

Topographically the east coast area of southern Florida is an extensive, almost flat, marl and limestone shelf covered with a variable thickness of sand and in some places muck. The vast low lying Glades area of south central Florida reaches to within a few miles of the coast and is separated

from the coast by a low ridge varying in width from two to twenty miles. The new parkway generally follows this ridge. South of the Broward-Palm Beach County line, this ridge is underlain by oolitic and sandy limestone and to the north by coquina (cemented shell beds) and marl. In some areas this sand ridge has been breached by ancient tidal flats. These breaches serve as outlets for inland drainage and in some instances contained extensive deposits of muck.

The biggest headache has been carving the road-

A Michigan Turbo-Dozer powered with a model 135 DKBS turbo charged Waukesha diesel rated 165 hp. It has a Clark industrial 3:1 multiplication ratio torque converter. Ralph Mills Construction Co. is the contractor on this section.

bed and spreading the 14,000,000 cu yds of fill required for the base. In some cases draglines had to dig thousands of tons of Everglades muck and replace it with crushed rock fill. Huge dieselized draglines scooped fill from canals on either side of the parkway for miles securing about 70% of the needed rock fill. Borrow rockpit lakes will become small beautiful wayside parks.

The largest of the 87 bridges on the turnpike will be over St. Lucie Canal near the north end of the pike. This bridge is 3000 ft long and soars skyward over the canal to give the canal boats, 58 ft below, plenty of clearance. The steepest climb on the whole parkway will be on this bridge, a 4½ percent grade, while the sharpest curve will be 1½ degrees, thus enabling practically all trucks to travel the entire length of the parkway without the necessity of changing gears.

A model 2T-55 International Pay-scraper powered with a Cummins HRRI diesel. Four of them were working on this section.

Hooper Equipment Co. Inc. has seven 21 yd Euclid bottom dumps powered with GM 6-71 diesels. John Hatten is the operator here.

Tony Lapicola, equipment maintenance superintendent of Capeletti Bros., road contractors who supplied some of the rock fill for the road bed stands beside one of the GM dieselized Euclid 21 yd bottom dumps.

The pavement will be 2½ in. of plant mixed asphaltic concrete made up of 1½ in. surface course. The base material will be 8 in. compacted lime rock placed on 12 in. of stabilized subbase compacted to a Florida bearing of at least 75 psi. The subbase is to be extended to a minimum of 12 in. beyond the pavement edge. This type of pavement has been selected because of its suitability in this area and its economy of construction and maintenance. A center divider strip 20 ft wide separates the north bound and south bound 24 ft roadways. Twin bridges are built to carry separated traffic over cross roads, canals and railroad tracks.

Florida's famous and colorful Seminole Indians from the Brighton Reservation condescended to take on the job of grass planting. A 28 year old squaw named Happy is the leader of a team of grass planters. This grass is being planted not merely for beauty but also to keep the shoulders and embankments from shifting. Another job was the stretching of fences on either side of the turnpike route, this being done by cowboys from the Okeechobee cattle area. The fence posts are usually made of cypress cut from the surrounding forests. The fence is being constructed to keep the cattle from straying onto the road.

The road will be maintained from two section maintenance areas, one located near Pompano Beach and the other at Stuart, and a division maintenance area to be located near West Palm Beach. The Sunshine State Parkway, when completed, will accomplish its immediate objective of providing a safe and direct means of North-South transportation from one end of Florida to the other. With its gentle curves and many easy cloverleaf interchanges, this new highway will save many hours of travel time and at the same time introduce car riders to large sections of Florida's wild and breathtaking Everglades. They will also see towering cypress trees dressed in wild orchid blooms.

The State Supreme Court validated $185,000,000 in Bonds the latter part of July to extend the Ibbtail turnpike from Fort Pierce to a point north of Jacksonville. Addition of the 279 mile northern extension to the 110 mile southern section, which is almost completed, will give Florida the longest toll turnpike in the nation running from Miami almost to the Georgia State line. The Turnpike Authority also forecast that a Tampa Bay leg reaching to the West, could be completed by the time the main road is ready for traffic.

A DW21 Caterpillar tractor with a #470 scraper is push loaded by a D9 Caterpillar tractor with turbocharged diesel equipped with a push cup. This section is south east of Davie and Troup Bros., the contractor who is building about 4 miles of the base road. It involves moving about 650,000 cu yds of material with hauls up to 2½ miles due to the location of the borrow pits. Five bridges will also be built in this section. The elevation in this area is about 7 ft above sea level.

THE FREE PISTON ENGINE

This Concluding Article Discusses the Smaller, Automotive Type Gasifier–Turbine Combination, And The General Advantages Of The Free Piston Engine.

Two Part Article
Part II

By J. W. BROWN*

FROM the GM-14 engine at General Motors Research Center, we were led to the test room wherein was ensconced the XP-500 experimental automobile, which is driven by the GMR 4-4 gasifier-turbine combination, rated at 250 gas hp. As luck would have it, XP-500 was jacked up for the repair of a leaky hydraulic line and could not be started at the time, but we had ample opportunity to examine it very closely.

As in the early days of any mechanical advance, it must be admitted that there is still much to be done to get this engine down in size and weight per horsepower comparable to the latest V-8 high compression gasoline engines. However, GM has made a great start in the XP-500's engine and undoubtedly current experiments in light-metal construction of various parts and possible refinements in design will bring rapid changes. The gasoline clunkers, in the days of priming cups and hand cranking, were different from today's V-8, too.

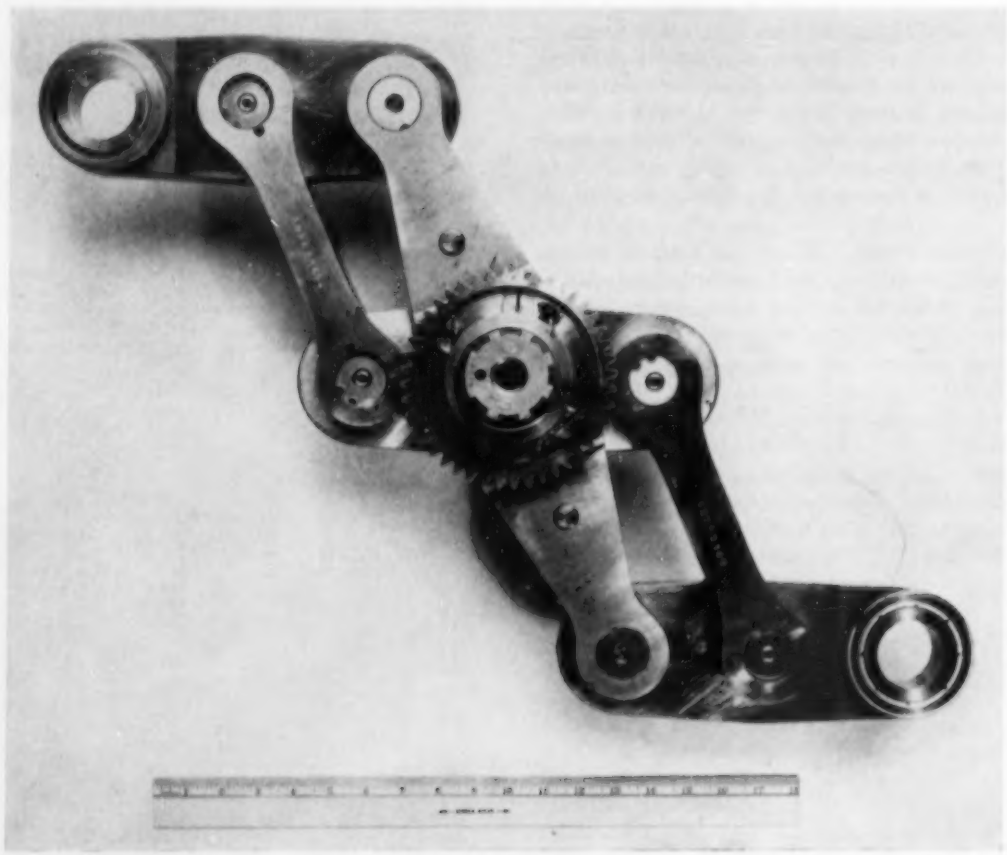
The outstanding design difference of the GMR 4-4 as compared to the GM-14 is that General Motors Research, for the first known time, put two free-piston cylinders side by side and gave them a common scavenging air chamber. This immediately resulted in a more compact engine for the desired output. Then they designed a dephaser, which causes one pair of pistons to be operating on the power stroke while the other pair is on the compression stroke. As a result the air compressing pistons of one cylinder supply scavenging air for the other and vice versa. The two pairs of pistons are started in phase but are thrown out of phase very shortly by the de-phasing mechanism. The result, according to Mr. Underwood, is smoother, quieter, more efficient operation. Other than the Siamezing innovation there is not much dissimilarity between the large GM-14 and the smaller GMR 4-4. The GM-14 incidentally is so designated because of a 14 in. diameter power cylinder; GMR 4-4 means that the smaller engine has two cylinders, each with a 4 in. bore.

The principal design drawback of the free-piston engine for automotive propulsion would seem to be the relationship between the power piston and the compressor piston. In the GMR 4-4, for instance, the 4 in. power pistons (with approximately 5 in. stroke) had to be mated with 11 in. diameter compressor pistons. Nothing of smaller area would do; the relationship is very critical. However even this disadvantage may some day be overcome; there may eventually be a way evolved to use two small compressor pistons to one power piston, for example, or to Vee the cylinders to a better configuration. Even now, the GMR 4-4 in the XP-500 is only 18 in. deep by 40 in. long by 34 in. wide.

The problem of accessory drives for the XP-500 was solved simply by taking the power from the turbine. The XP-500 drives through a hydraulic coupling, so that the turbine turns constantly even when the engine is idling. The hydraulic coupling, (ahead of the gears) also does away with the necessity of by-passing the exhaust gases while idling. Power for an electric battery-charging generator, water pump and power steering is taken directly from the turbine and the fan is powered by a turbine-driven hydraulic pump and a remote hydraulic motor. An electrically (battery) driven air compressor is another important accessory. It provides the 30 psi air pressure necessary for starting, and does it directly, without need for a storage tank.

Until recently free-piston engines were handicapped in economy by the fact that they would not operate on a fuel input of less than 25% of full requirements. Today a method of recirculation of the compressed scavenging air back through the compressor air intake when idling or running under part load results in pre-heating combustion intake air to the degree that combustion efficiency becomes high at lower compression ratios. The stroke is accordingly shortened, bounce chamber pressures reduced and the engine can loaf where before it would simply have died on a lesser fuel input. Some free-piston engines running today

The parallelogram linkage from the experimental GM-14 free-piston engine. This linkage supplies power to operate the fuel pump and any other accessories; it also connects the two pistons and keeps them in phase.



* *Detroit Editor, DIESEL PROGRESS*

can idle on one twelfth of the fuel required for full load, which is a great improvement.

General Advantages of the Gasifier-Turbine As a Power Source

1.—Wide Range Of Fuels Possible. The high compressions at which the free-piston gasifier is operated under loads result in a quality of combustion heretofore unattained by internal combustion engines. The free-piston engine seems to run well on any combustible liquid that can be fed successfully through the injectors, and without appreciable deposits being built up on pistons, cylinder walls or ports. Indeed, the free-piston engine makes come true a lot of half-truths that have been widely and harmfully quoted about diesel engines in general. This universal taste in fuels opens up wide possibilities capable of future development if, as and when, we do run short of natural fuels.

2.—Lower Fuel Costs Possible. The free-piston engine produces gas horsepower at an efficiency in the 40% to 45% range at full load. The terminal efficiency depends naturally upon the efficiency of the turbine through which the gases are converted into usable horsepower. A currently obtainable turbine efficiency of 80% gives an overall efficiency as high as 32 - 36% which is in the range of current diesels. This, coupled with the use of cheaper, lower grade fuels such as Bunker C fuel oil could result in lower fuel cost per horsepower-hour than any other type of engine we have today.

3.—Smoothness. Quoting Mr. Underwood, "All free-piston engines are inherently balanced and require no special design or attention except that all similar oscillating or reciprocating parts must have exactly the same weight." As an example, the 1250 gas hp free-piston engine at General Motors Research Center has never had to be bolted down.

4.—Flexibility Of Arrangement Of Components. The free-piston gasifier-turbine combination has the flexibility of arrangement possible in diesel-electric drive or the older boiler-steam engine combination (without the latter's bulk). Since the gases leave the gasifier at a relatively low temperature (450° to 950° F), relatively simple insulated piping can be used to connect the gasifier and a remotely located turbine. Also two or more gasifiers can be fed into a single turbine. In the case of the *S. S. William Patterson,* six engines will feed into a common header from which two reversible turbines will be fed. In the XP-500 automobile the gases are led from the free-piston gasifier under the hood to the turbine and transmission unit in the rear through a 3½ in. diameter pipe which runs along the frame of the car. This does away with the annoying transmission hump usually found in the floor of modern automobiles.

With a lot fewer rotating and reciprocating parts, this type of power should have predictably lower maintenance costs and fewer breakdowns caused by wear or fatigue of parts. When an overhaul is necessary the gasifier part is more easily torn down and re-assembled than a crankshaft engine. The turbine is subject to little wear, other than on the bearings. There are many other interesting characteristics of this type of power which space does not permit us to evaluate here. Among these are the possibilities of adding an afterburner between the gasifier and the turbine for peak horsepower demands. Another is the high-torque-at-low-speed characteristic of the turbine, making possible rapid acceleration under load without resorting to hydraulic torque converters.

Mr. Underwood pointed out in his S.A.E. paper that the free-piston gasifier-turbine combination, for either stationary or automotive use, is in the early experimental stages, and that it took sixty years to bring the gasoline engine to its present state of development. Granting this, there seems to be at present no insuperable obstacle to the possible future application of the free-piston engine to the numerous and varied tasks now shouldered by diesel engines. A big question mark, so far, hovers over the possible cost of manufacture—will the cost of forging and machining crankshafts, cam shafts, bearings, timing gears and valve mechanisms of our current diesel engines be offset by the simpler valve mechanisms, etc., of the free-piston engine plus the cost of a turbine? If the free-piston engine and turbine combination offers attractive manufacturing savings, we can expect to see it exploited rapidly. If not, its development into the mass production stage will be much slower as it will depend entirely on the continued availability of our current diesel fuels. Having, as it does, a lot fewer obvious drawbacks than the promiscuous use of atomic power, the free-piston engine—gas turbine combination may become the most plausible stepping stone between the age of diesel and the age of atomic power.

GMR 4-4 Siamesed free-piston gasifier in the XP-500. Left to right: Arthur F. Underwood, head of Mechanical Development Department, General Motors Research Staff; Worth Percival, supervisor of engine development; Gregory Flynn, Jr., assistant head, Mechanical Development Department. Operating speeds of the GMR 4-4 free-piston gasifier range from 1,000 to 2,400 strokes or cycles per minute.

MODERN LOS ANGELES COMPRESSOR STATION

Eight Turbocharged Gas Engine-Driven Compressors Replace Steam Units In $5,000,000 Facility.

By JAMES JOSEPH

A MAJOR gas distribution plant is being razed, its nine venerable steam compressors replaced by eight, 2000 hp Ingersoll-Rand turbocharged gas engine-driven compressors—a $5,000,000 modernization which will see distribution system pressures upped 10 psi in the Los Angeles area, plant capacity raised by 1.5 MMcf/hour. Involved is Southern California Gas Co.'s Ducommun street compressor station and its nine Hamilton Corliss valve steam engines installed between 1900-1924. Here, during five decades, manufactured and holder-stored gas was pumped into distribution lines feeding a half dozen Los Angeles-area communities. Now, with 1,500,000-plus customers and gas usage steeply up, Southern California Gas Co. is investing $5,000,000 in what promises to be among the most modern of compressor stations, its heart the gas-fired turbocharged units. The eight Ingersoll-Rands are type 412 KVS-2 heavy duty, direct-connected, turbocharged, 4-cycle, gas engine driven, 2-stage gas compressors. Each will be unitized for self-sufficiency, capable of operating independently of the others when necessary.

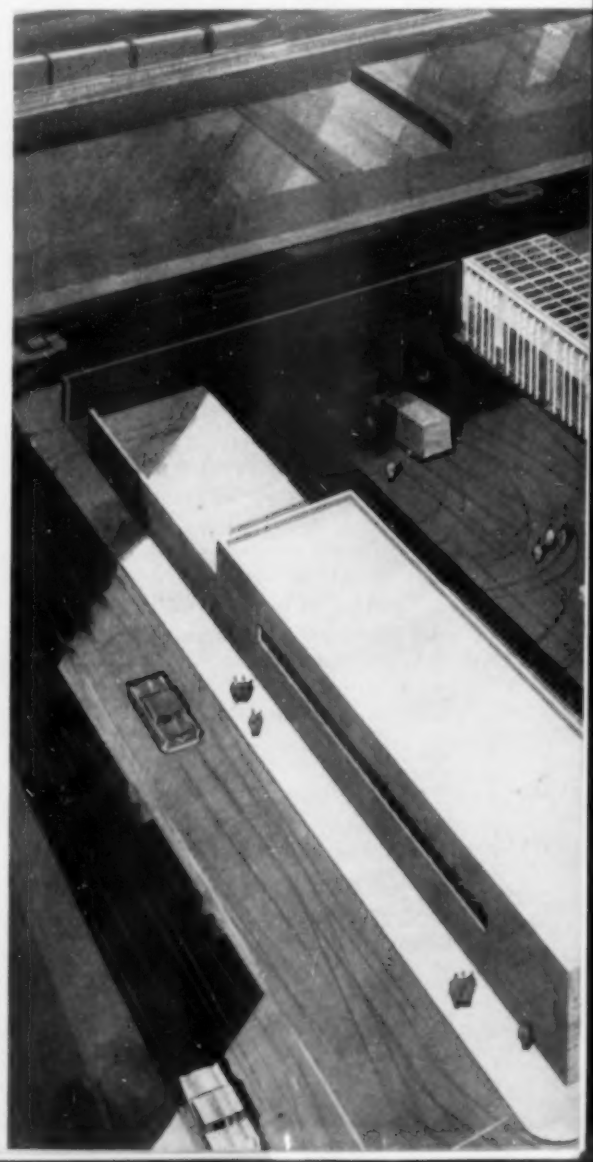
The replacement emphasizes progress in compressor design. The old Hamiltons, each 2750 hp, had 30-ton flywheels, 5-ft compressor cylinders, needed 22 boilers (500 to 1000 hp) for motivation. Combined boiler output approximated 500,000-lbs of steam/hour. Typically, each Hamilton utilized about 50,000-lbs of 150 psi steam hourly. Boilers were gas-fired, used fuel oil for standby. During the war, four compressors were converted to butadiene production, the basis for synthetic rubber. Working around the clock, the steam engines helped pump gas made from some 20,000 barrels of oil daily. End product was C-4 cut which was piped to Los Angeles synthetic rubber plants, where butadiene was made, eventually processed into wartime rubber. Earlier, the compressor station fed manufactured gas into Los Angeles mains.

The current modernization is practically a grounds-up operation, with most of the old station's buildings being torn down, and new ones erected. Still retained as heart of the station are five big natural gas holding tanks. These are supplied Texas gas from the 1200-mile Biggest Inch pipeline, which links Texas, New Mexico and Colorado oil-gas fields with Southern California. Roughly, 45 per cent of Southern California Gas Co.'s 90,000,000 cu ft of above-ground storage in the Los Angeles basin is concentrated near the Ducommun street compressor station in five holders. These range in capacity from 5,000,000 to 15,000,000 cu ft. The largest is a piston-type holder, some 340-ft tall, 280-ft diameter. Its 280-ft diameter piston weighs 650,000-lbs, and lowers-raises depending on the volume of gas in the tank. Primarily, Ducommun is a regulating station. Its 8 Ingersoll-Rand compressors will pump stored natural gas (from the five holders) into Los Angeles mains, working in conjunction with the utility's Spence street compressor station, which receives gas directly from the Biggest Inch line. Ducommun and Spence gas meet in a header at Ducommun. The prime job: to keep header pressure at 70 psi, the flow approximating 10,000,000 cu/ft/hour. Typically, Biggest Inch gas direct from the 1200-mile pipeline may be incoming at 150 psi and at rate of 4½ MMcf/hr. Before entering the Ducommun header it's regulated down to say 70 psi. But another 5½ MMcf/hr must be supplied by Ducommun from storage, to keep header flow at the required distribution rate of 10 MMcf/hr. From header, gas feeds via 7 lines (14 to 20-in. dia.) to a half dozen Los Angeles basin communities and to the utility's Slauson Avenue distribution station.

Increased compressor capacity will mean higher discharge pressures into Southern California Gas' feeder lines—in effect, up the delivery capacity of these lines. Discharge pressures, with activation of the modernized compressor station, will be upped about 10 psi (from a current 60 psi to an operational 70 psi). The utility will realize greater distribution capacity with existing lines. Additionally, it'll mean better control of the utility's load equation—how and where gas is held in storage, and how it's distributed to meet fluctuations in load. Some variances occur daily, the demand for gas increasing during the day, falling off as gas usage tapers off at night. Variances likewise occur during summer's low usage and winter's peaks. The average residential customer uses four times as much gas on a winter day as he does on a summer day (on a very cold day it may be 7 times the normal). Above-ground holders store gas for hourly variations.The new Ducommun compressor station will be at least one major variance-control in Southern California Gas Co.'s system, its control pegged primarily to hourly differences in demand.

Storage of far larger volumes of gas—this to supply winter's heavy load and to store huge amounts of gas not needed during the low-demand summer—falls to mammoth underground holding reservoirs at Goleta (owned by Pacific Lighting & Gas Co.) and Playa Del Rey, California. These underground reservoirs are depleted gas fields which have been injected under pressure with natural gas. Gas is stored in these sealed underground formations during the summer, is released into the system come winter's high demand. Thus, Ducommun's function in So-Cal's system is to control hourly fluctuations in flow rates and pressures—all keyed to consumer and industrial demand. With the Ducommun header's discharge pressure scheduled for a 10 psi increase (to 70 psi), more gas can be pumped into distribution lines, helping to empty above-ground storage vessels and giving the holders more versatility at all times.

Replacing the old Ducommun street station is a now-abuilding 42x192-ft rigid frame steel building. It'll be roofed with corrugated cement asbestos, its north and south exteriors faced in brick and



metal. The eight Ingersoll-Rand, 2-stage gas compressors will be installed in-line down the building's approximate center. Each compressor will be unitized—capable of operating alone, with all its controls unitized for immediate action.

"Centralization," says a Southern California Gas Co. engineer, "would have risked shut down of all compressors should there be a central control failure. So unitization is the key. Unitization also decreed eight engines of fairly modest horsepower, rather than one or two very large engines. When we need pressure, we need it, and eight compressors are insurance against the failure of any one."

Tied to each of the eight is a bank of air cooled fin fan exchangers. In each bank is a jacket water cooler, a gas intercooler, gas after cooler, air fan unit (a 16-ft dia., six bladed fan) and a LO and CC water cooler. Driving each fin-fan exchanger is a hydraulic oil system. This system consists of hydraulic drive pumps directly connected to the flywheel end of the gas compressor, the pump output piped to a hydraulic drive motor. Motor drives right angle gear reducers which, in turn, drive the air fan. Fan speed is controlled by a manually operated by-passing of the motor. Hydraulic pumps are 330 rpm, 1000 psi, 158.5 gpm. Hydraulic drive motors are Berry 43/36.5 hp. Each compressor engine takes air thru an intake filter. Filters are 48-in. O.D., 17-ft high. Connected to each engine's exhaust manifold is an exhaust muffler.

Installed will be two starting air compressors, one of them a standby. The main compressor is a 3-in. x 7-in., Type ES-1 Ingersoll-Rand double acting, booster air compressor with free air unloaders, lubricator and a 15 hp motor, the compressor V-belt driven. Standby unit is a type H-40-B two stage horizontal (Ingersoll-Rand) air cooled reciprocating compressor, complete with constant speed control. Compressor is belt-driven by a natural gas (oil field) power unit. Station's main air compressor is an Ingersoll-Rand PHE, 12½ in. x 7¾ in. x 6 in. two stage, direct connected to a 100 hp GE induction motor. Compressors will also be equipped with pulsation dampeners and volume bottles—these to smooth out the puffs created by reciprocating action of compressors. Dampening eliminates one of chief causes of piping vibrations. Also, smooth, steady gas flow means less frictional resistance, less line breakage thru pipe fatigue. A first-stage pulsation dampener and second stage volume bottle mount atop compressor cylinders on the cylinder inlet transition pieces. Pulsation dampeners are 48-in. O.D. x 26-ft with five 20-in. and one 30-in. major nozzles. Horizontal first-stage volume bottles (36-in. O.D. x 13-ft) are connected to the bottom outlet transition pieces on the first stage compressor cylinders. Each has four 20-in., 150-lb major nozzles. Additionally, compressors are installed with second stage pulsation dampeners. These connect to the bottom outlet transition pieces on the second stage compressor cylinders. They're 36-in. O.D., 9-ft long, and each has two 20-in. and one 14-in. 150-lb major nozzles.

Each compressor will have its individual control panel. Major controls include: (1) lube oil temperature; (2) lube oil pressure; (3) overspeed control; (4) jacket water temperature; (5) intermediate scrubber float switch; (6) fan vibrator cut-out; (7) hydraulic oil pressure switch. Additionally, two banks (four each) of pressure switches will serve each unit.

Despite increased capacity, the new compressors will with their auxiliary equipment occupy less than half the space required by the obsoleted steam-driven compressors. Remainder of space in the new station will go for a workshop, employees' locker and change room, auxiliary generating plant, garage and receiving yard. Engineering and construction is being handled by Guy T. Martin and Co., Inc. Consulting architects are Allison and Rible, Los Angeles.

List of Equipment

Main Gas Compressors—Ingersoll-Rand

Starting Air Compressor—Ingersoll-Rand

Air Compressor—Ingersoll-Rand

Fin Fan Exchangers—Fluor

Intake Air Filters—Burgess-Manning

Plant Air Filter—Dollinger

Exhaust Mufflers—Burgess-Manning

Oil Cooler—Ross

Jacket Water Cooler—Fluor

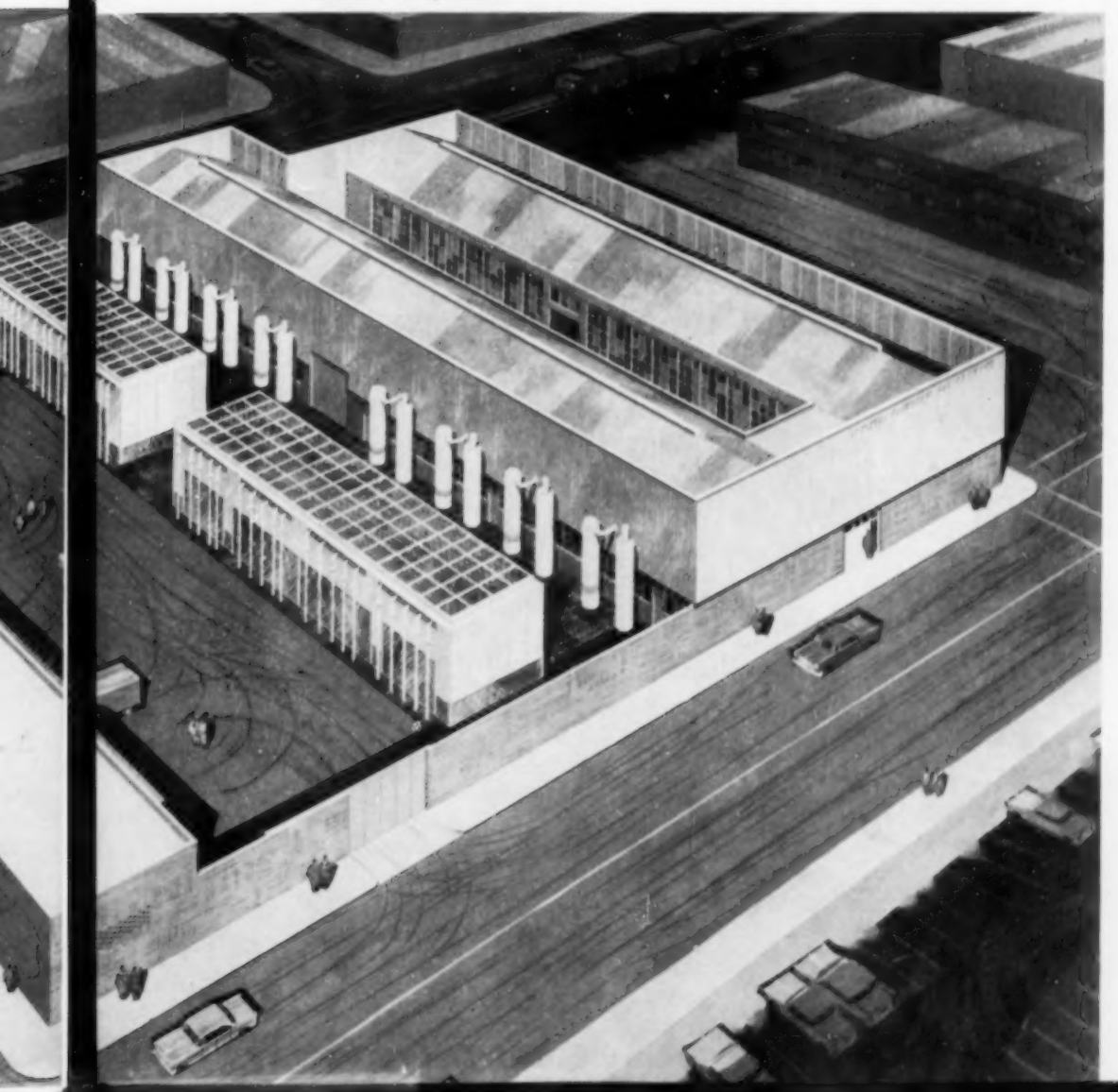
LO & CC Water Cooler—Fluor

Gas Intercooler—Fluor

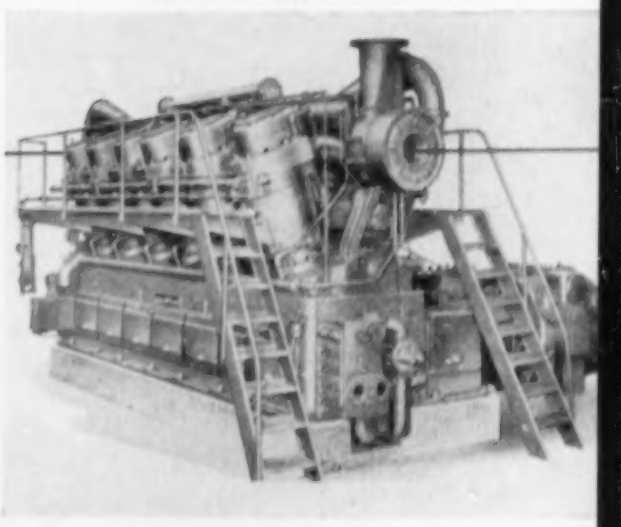
Pumps—Ingersoll-Rand, Berry, Pacific, Simonds, DeLaval, Union, Peerless

Natural Gas Engine—Waukesha

Architects conception of how the new Los Angeles Gas Compressor Station will look on completion.



A view of the Ingersoll-Rand 2000 hp, Model KVS turbocharged gas engine-driven compressor, eight of which are being installed in the new Los Angeles Compressor Station.



LOTTA BULL IS DESIGNED FOR LOW HEIGHT OPERATION

By ARNOLD B. NEWELL

ONE of the smaller new towboats of interesting design and construction is the triple screw, welded steel, diesel propelled *Lotta Bull*, built by the Nashville Bridge Company of Nashville, Tenn. for the Bull Towing Company of Joliet, Ill. This is a vessel 95 ft 6 in. long, 26 ft 6 in. wide and 8 ft 6 in. deep. The three propulsion engines are Fairbanks-Morse 8-cylinder Model 31A8½ direct reversing units rated 480 hp each at 525 rpm, driving 64 in. Avondale stainless steel propellers through a marine reduction gear on the engine having a reduction ratio of 1.64:1.

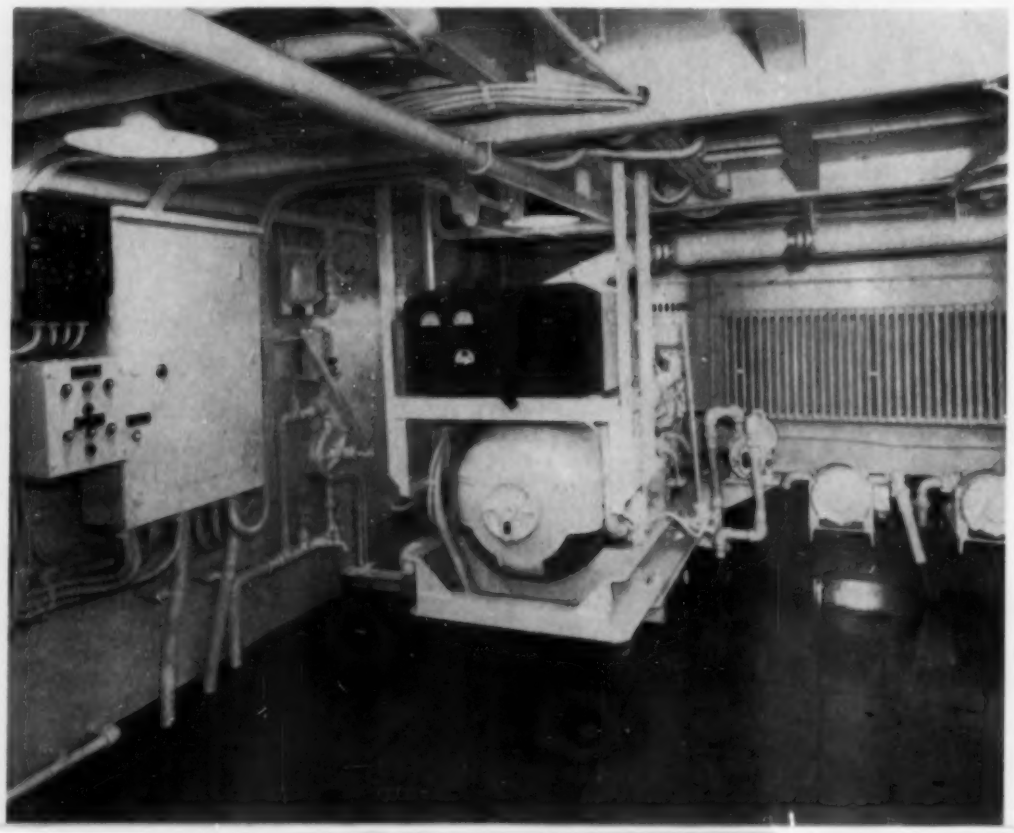
The hull and superstructure are of welded steel throughout and the special design characteristic is low height for work under fixed bridges and retractable pilothouse. It sometimes happens, as in this case, that special purpose vessels for use on the inland waterways are somewhat more interesting in design than some of the power packed behemoths with tremendous power to push huge barge trains on the Mississippi. In *Lotta Bull* we have a type of vessel essentially restricted not alone in height above the water but in total vertical dimensions that must remain within the space from the bottom of the channel to the under side of the fixed bridge crossing that channel. In order to work within these limitations and at the same time have ample power, the triple screw arrangement has obvious advantages. Men working on river vessels are accustomed to comfortable living quarters and in this case they are confined to a single deckhouse on the main deck where space for quarters is further limited by the need of room for lowering the pilothouse. This is a feature which also limits the floor space in the pilothouse and creates the need of complete flexibility of every connection with the rest of the vessel. To this end Westinghouse controls are employed.

Lotta Bull has a spoon bow and conventional flat stern. The towing knees are 12 ft 6 in. above the water line. At the stern there are three steering rudders, one abaft each propeller and two flanking rudders, one ahead of each wing propeller. At the extreme front end of the deckhouse store rooms for deck stores are provided on each side of what is a sort of elevator shaft in which the pilothouse raises and lowers as required. Stairs for access to the deckhouse are arranged starboard, forward within the deckhouse. The engineroom is forward of the mdidle at about the center of buoyancy and it occupies deckhouse as well as the hull space. All living quarters are confined to the after end of the vessel. For ten men there are five staterooms insulated with acoustic board, rockwool and fibreglass against heat of summer and cold of winter. There is direct access to toilets and bath or shower from each of the staterooms. Running hot and cold water, central heat and all other conventional contributions to creature comfort are provided. Galley-dining room is spacious. There is an adjoining store room with ample shelf space and a 17.5 cu ft deep freeze in addition to the electric refrigerator in the galley. The range is an oil burner. Table seats five. Sink and cabinets are of the best. Floors are Ken-tile and Terra-Flex. Ventilation is by electric exhaust fan.

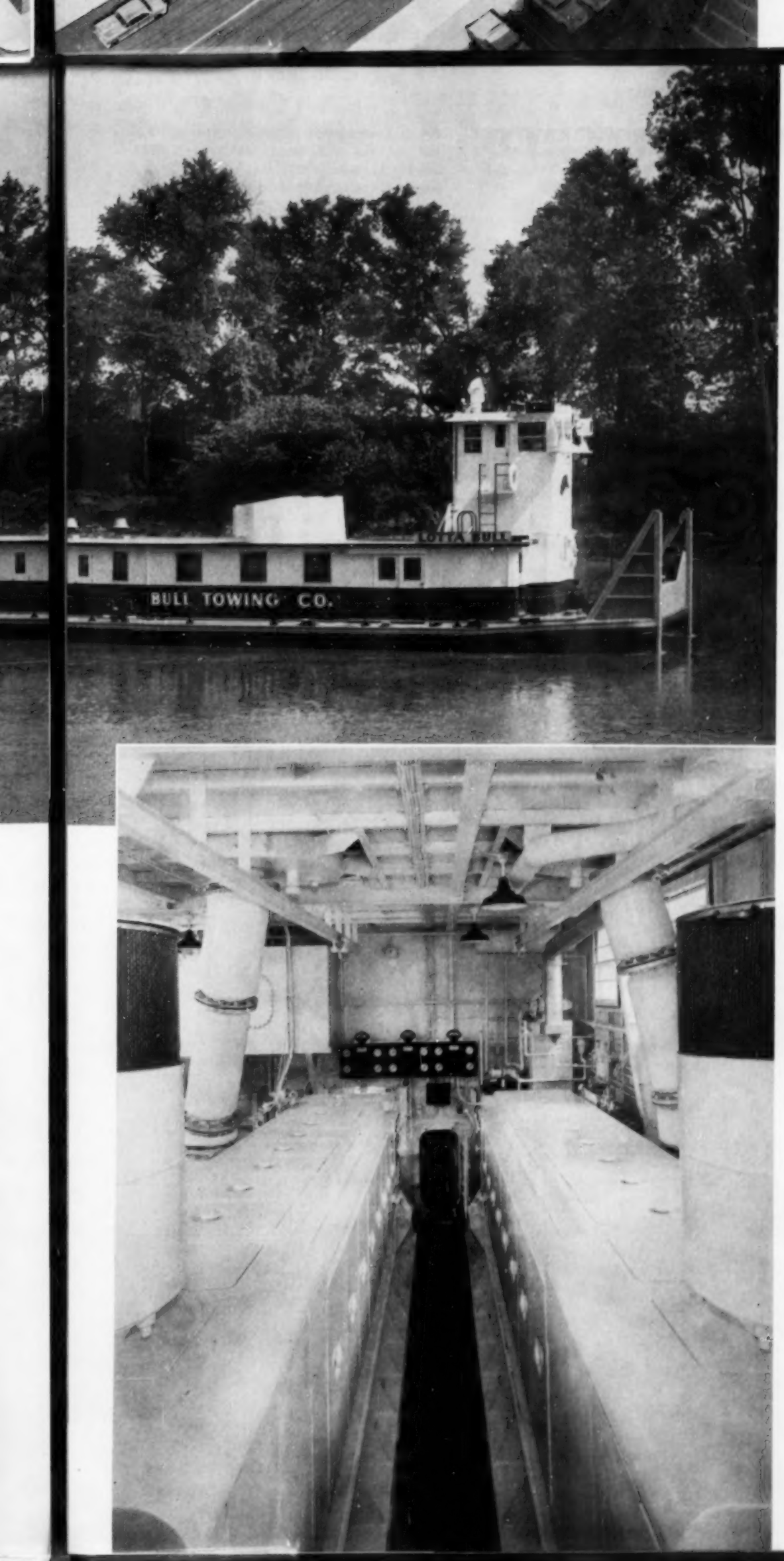
There are wing tanks on each side of the hull. Fuel is carried in four of these tanks forward and two aft. Fresh water is carried in the midship tanks. A typical cross section reveals a hull of modest flare with 24 in. radius at chine and a v-bottom with a 2 ft rise from line of keel to start of chine. Rise of the spoon bow starts between frames 8 and 10 while the rise at the stern begins at frame 32. The frame spacing is 2 ft. There are eight kevels, four on each side of the main deck. Six of these are 36 in. The aftermost ones are 42 in. There are two winches at the bow.

The machinery installation is indeed of more than passing interest. In addition to the Fairbanks-Morse 8-cylinder 8½ in. bore by 11½ in. stroke main engines of 2-cycle type, there are two General Motors 4-71 auxiliary diesels each driving a 40 kw Delco ac generator, 50 kva, 220 volt, 131 amp, 60 cycle, 1200 rpm, 3 phase with 125 volt 12.4 amp dc excitation. The machinery installation is as clean as a hound's tooth and no foolin'. In all cases the main and auxiliary diesels are protected against over temperature or under pressure of water and lube oil by contact makers. Engine exhaust and intakes are silenced by Maxim.

A streamlined effect is achieved with the pilothouse lowered, but this is not the best position from an operational point of view. Here you see the pilothouse up, which improves the visibility.



General Motors 40 kw generating set is neatly installed in a spacious engine room. Electric Machinery Synchrostat control panel for generating set is installed above generator.



Since the main engines are direct reversing and maneuver on compressed air the two air compressors are of considerable capacity. They are 2-stage with 3½ in. stroke, cylinder bores being 4¼ in. and 2¼ in., low and high pressure respectively. They are each equipped with a 5 hp GE motor and Penn pressure switch. There is a separate lube oil pump for each main engine, driven by 3 hp Century motors. Lube oil filters are Briggs with type A447 refills. Fuel oil service and transfer pumps are rotary type with motor drive. The fresh water and sanitary water pressure sets are Fairbanks-Morse units. There are two combination fire, bilge and deck wash pumps on a 2 in. line, driven by 3 hp Century motors.

Navigational equipment in the pilothouse is quite complete. It includes radio telephone, a Remler marine order system, sound powered telephone, an 8 in. Commander Kahlenberg air horn and a pair of Carlisle Finch 19 in. searchlights, one of carbon arc and the other of incandescent types. Pilothouse controls are Westinghouse. The lift is Globe. The Nashville Bridge Company produced several items of equipment including the hydraulic steering gears, the deck winches and the closed fresh water system is a Nabrico skin cooler.

Principal Equipment

Main Engines	Fairbanks Morse
Auxiliary Engines	General Motors
Switchboard and controls	Lake Shore Electric
Generators	Delco Products
Oil Filters	Briggs
Propellers	Avondale
Pyrometers	Almor
Silencers	Maxim
Air Compressors	Gardner Denver
Oil pumps, main engine	Roper
Oil pumps, transfer	Viking
Fire and Bilge Pumps	Marine Products
Fuel Pumps, service	Viking
Hydraulic pumps (2)	Roper
Heating system	Way Wolf
Range	Webb
Refrigerator	Gibson
Freezer	Gibson
Water cooler	Westinghouse
Windows	Truscon
Searchlights	Carlisle Finch
Radar	RCA
Radio Phone	RCA
Tachometers, Electric	Weston
Capstan	Link Belt

Compact design of the Fairbanks-Morse main propulsion engines results in an accessible installation in an engineroom arrangement as functional as it is clean. Almor pyrometers on Lakeshore Electric switchboard at far end of engineroom.

OLD GRAY MARE UNHITCHED

Ammonia in Anhydrous and Solid Forms Has Become a Boom Industry to Supply Nitrogen Fertilizers to U.S. Agriculture.

By F. HAL HIGGINS

"THESE professors seem to be dishing up ammonia in society style to replace what we used to have to fork out from behind the old gray mare." So a grizzled farmer visiting the opening of the big Shell experimental farm near Modesto, Calif., commented after following the welcoming guides around laboratories, plots and fields. That was scarcely a decade ago. Most of the big oil products manufacturers have gotten into the chemical field with fertilizers, insecticides, herbicides for weed control, defoliants and dozens of other fields that are turning up to keep armies of scientists mixing up and testing new chemical combinations to both solve new problems and meet competition of rival industries. The research department of multi-million and billion dollar industries is one of the marvels of the post-war era. Not only is it well financed and equipped with the best trained specialists to be found and all the plant, tools, and land and crops needed to develop and prove their theories and products, but the farmer has been waiting and demanding products to cut costs and increase profits from his lands.

A nitrogen surplus is building up now that the farm acreage in crops is helping to cut down in areas devoted to crops like cotton, rice, wheat, corn, etc. The leadership of the Shell setup began with hiring an agricultural engineer to develop machines to be powered by tractors to apply their chemicals early after their opening up the fertilizer field for their pioneer plant built in the San Francisco Bay area. That was more than a quarter century ago. Only California got the benefits of the nitrogen fixed from the atmosphere by the plant near Pittsburgh, Calif.; for several years the big cartridges were unloaded at irrigated orchards and low crop fields were set up to feed ammonia into irrigation waters. But by the end of the war, the idea of taking free air and making fertilizers of it was picked up by most of the leading oil companies. Anhydrous ammonia is 82% nitrogen, and that is a key element needed by most U. S. crops. What kind of dealers handle these chemicals sold and serviced for fertilizers, weed and insect controls? The writer had been trying to get the answers to this question over the past decade as he saw airplanes, motor trucks and tractors sold, serviced and successfully fitted into the mechanized farming system to give growers a big lift in production efficiency. Here and there, an old full line farm machine dealer took a hand at trying to handle a line of chemicals for his farmer territory. Other dealers were the little old chicken feed dealers who have learned something of safe storage of chemical products over the years of handling feeds, seeds and garden tools. But the answer to agricultural chemical sales-service that struck the writer after looking over the West is Associated Farm Supplies, out on the south edge of Stockton. "Fertilizers, insecticides, weed sprays, seeds, feeds, soil fumigants, orchard sprays", says the firm's sign.

Associated's office and store was something more modern than the old sheds along railroad tracks on the outskirts of the town. But the big difference is personnel. Here graduate agricultural college men with years of experience in farm extension work were found. A glance at the equipment they were using and assembling for custom operators was a revelation. The place of diesel tractors for powering these applicators was noted. Not only the standard crawler tractors of Allis-Chalmers, Caterpillar, International and Oliver were found, but wheeled diesels as well for lighter work. Some

Shown in circle and below is the Barenchi and Worden operation at Vernalis. For $90 they constructed this rig that applies liquid fertilizer at the same time that the ground is being furrowed out and seeded to tomatoes. Tractor is an Allis-Chalmers HD5 diesel. View below is the rear view of the operation.

of the Associated Farm Supplies equipment: An Oliver 88 diesel carries special ammonia tank that is filled from Associated's special truck for transporting liquid nitrogen to its tractors in the field. The Aqua Ammonia, as it is called is pumped from truck to tractor through a hose to permit easy refilling. This outfit was at work on an asparagus field belonging to Frank Tenente, near Holt, 10 miles west of Stockton in the rich peat soils.

Barenchi & Worden, Vernalis on the San Joaquin West Side, fitted up their Allis-Chalmers HD5 crawler diesel to apply ammonia fertilizer as their tomatoes are being seeded direct instead of transplanted as in former times. This Barenchi & Worden outfit is one of the neatest combination packages to be found for handling several field jobs at one pass. A drum of NH_3 (ammonia, or liquid nitrogen) is carried out in front on the tractor with a 4-bed tomato seeding and bedding outfit pulled behind. The ranch owners built the combination to be carried and pulled by their trusty diesel at a cost of a mere $90. Direct seeding of tomatoes instead of the traditional transplanting is one of the major achievements of the ingenious California vegetable growers working with the University of California agricultural college at Davis. Only a few years ago, it was one of those debatable problems that was being tried by a few venturesome gamblers who were willing to risk a crop year's use of a field. Some lost, and some succeeded well enough to decide then it could be done. As a result, the leadership of California tomato growers has lifted the state to No. 1 position in tomatoes. This development got rid of a lag in time of getting the tomatoes re-started after they are transplanted. But the cut in labor is the big gain.

Sugar beet farmers of the West are also big users of fertilizers. They have worked out many combinations to hitch to their big diesel tractors of all four crawler makes to shape seedbed, plant the new monogerm beet seed and meter the exact amounts of fertilizers needed for crop and soil. Up in the Northwest, diesel tractor dealers have developed big tank tractor trailers to feed the liquid nitrogen in tremendous amounts into the wheat, canning pea, and other seedbeds. Efficiency of dieselized farming has kept raising production per acre and per hour of diesel tractor work.

Down in the famous lettuce bowl of the world, the Salinas Valley, are several firms with more know-how based on experience in mixing and applying fertilizers to fit crops and soils than can be found in any other farming area of the world. Two to five crops in two years are standard practice for many vegetable crops here. Triangle Co. with 28 years in this specialized business is an example of specialists in applying fertilizers and insecticides to the crops in this area. Triangle offers three nitrogen solutions: aqua ammonia and ammonium nitrate, each with 20% nitrogen, and ammonia ammonium nitrate with 40.6% nitrogen. A younger firm the writer noted in a recent visit to the famous salad bowl is John Pryor Co., which is pioneering several liquid nitrogen and other fertilizers. Pryor has standardized on diesels and has eight diesel tractors specially equipped to apply his mixtures of nitrogen to fit the crop and soil being served. A visit to his headquarters found Pryor sending out his D4 Cat on a special trailer truck that is hitched behind the tanker truck that goes out to each job with the diesel tractor. Pryor now also has seven Oliver diesels in model 88, 77 and 66 sizes. We found one of them in a field of lettuce being serviced from a tank of ammonia. On this day six of the Pryor diesel tractors were out on the jobs applying liquid fertilizers from his depot of big tanks with their different compounds of nitrogen and other fertilizer elements.

Another thing noted in the Salinas Valley as well as in all farming areas of the West where the fertilizer service has been developed to such high efficiency is that the oil companies have also developed their services to such a high efficiency they are practically taken for granted. Texaco, Standard of California, Shell and others have distributors whose truck service carries their products right out to the fields and into the ranch yards to keep spreading equipment rolling. One notes that the oil industry is also a leader in chemical agriculture including the production and equipment development for its application. Hence, one finds both oil and fertilizer service company on a ranch at the same time. So, any reference to the Old Gray Mare of song and story must be adjusted to the super specialist in applying nitrogen in the right amounts to get bigger, better and more profitable crops.

It would take all the king's horses to put as much ammonia on this 6,000 acre wheat field in eastern Washington as these two big D7 Cats are applying from the two pairs of anhydrous ammonia tanks trailed behind the Graham Hoeme tillers that open up the wheat seedbed and measure its rate of application to boost the crop. The application of liquid nitrogen fertilizer in the big northwest wheat fields is now standard practice and it is an all-diesel farming system from seedbed to harvest.

FRANKLIN, LOUISIANA

By H. W. VOELKEL*

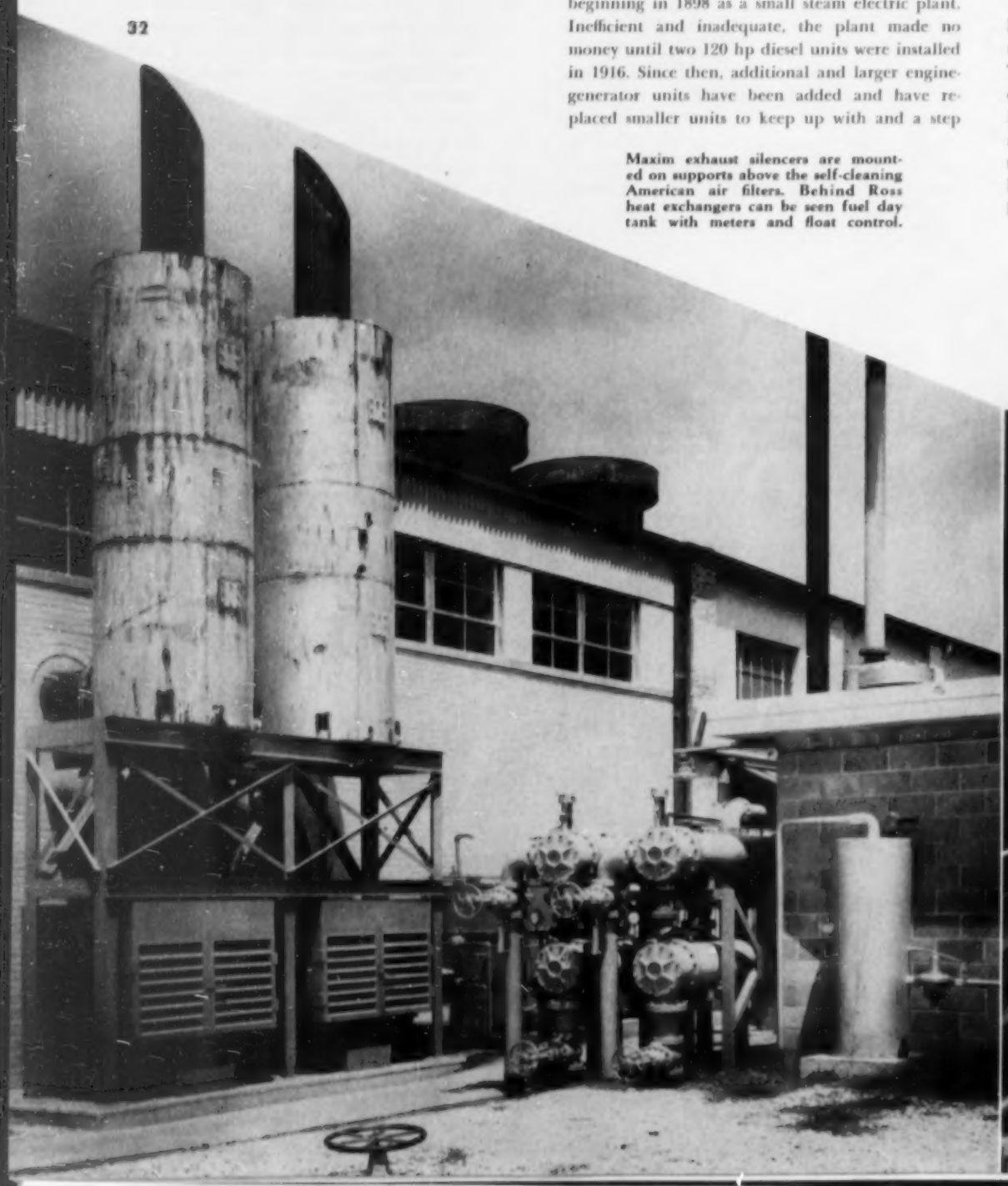
FRANKLIN, though still retaining its old world charm, is the center of a rapidly developing and fabulously wealthy area of oil fields, industry and agriculture. Located on famous Bayou Teche, where many Acadians settled, Franklin still reflects the folk lore and romantic era depicted in Longfellow's poem *Evangeline;* Evangeline who wandered through this bayou country in search of her Gabriel. Contrasting with its oak shaded streets and magnificent old plantation homes is the industrial boom surrounding Franklin. In the short span of three years, Franklin has assumed nationwide prominence as the leading carbon black producing area in the United States. Millions of barrels of oil and billions of cubic feet of gas are flowing monthly from wells in this area. Vast fields of sugar cane still provide the main agricultural income of this section of the country.

With all this activity, is there any wonder that the Town of Franklin is growing? The population increased from 4,254 in 1940 to 6,127 in 1950 and a conservative estimate as of 1956 is 8,000. It is this population growth and the usual increase in electrical appliances in each home, and especially air conditioning, that accounts for the rise in power demand; for with all the industrial activity in the area, a small furniture factory is the only industry directly served by the Municipal Power Plant. The demand for electrical power has risen rapidly. In 1955, 8,517,000 kwh were generated compared with 4,719,000 kwh in 1950. In 1956 the load increased 100,000 kwh per month over 1955, or nearly 15%.

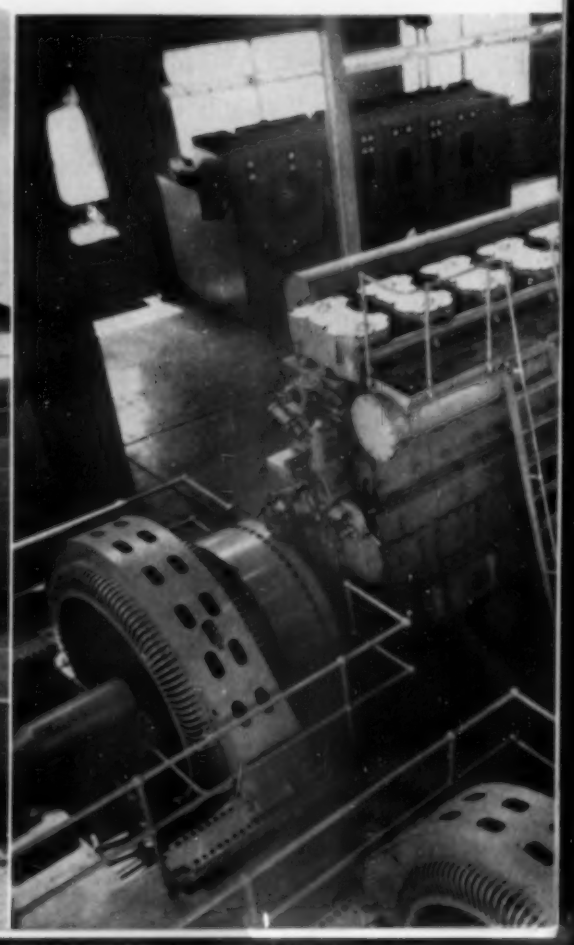
Many changes have been made in the Municipal Electric Generating Plant of Franklin since its beginning in 1898 as a small steam electric plant. Inefficient and inadequate, the plant made no money until two 120 hp diesel units were installed in 1916. Since then, additional and larger engine-generator units have been added and have replaced smaller units to keep up with and a step ahead of the demand. With the summer of 1955 expected to bring peak loads in excess of the firm power, the progressive team of Mayor W. McKerall O'Niell, Councilmen Randolph A. LeBlanc, Albert H. Blevins, D. J. Blakesley, Charles M. Morris and Philip Cusimano, City Engineer R. E. Miller, Jr., Plant Supt. A. W. Ibert, and Town Clerk E. J. Champagne, Jr., employed the firm of Barnard and Burk, Consulting Engineers of Baton Rouge, Louisiana to make a study of the present and future needs of the town's electrical system and power plant, and to make an engineering report setting forth the recommended improvements along with an extensive feasibility report showing that the recommended improvements would be economically feasible, and could be paid for entirely out of the revenues derived from the system. The Mayor and Council advertised for bids on two dual-fuel engine generating units. Upon Barnard and Burk's recommendation, the Mayor and Council awarded the contract to A. M. Lockett & Co., Ltd., of New Orleans, Louisiana for the purchase of two 1,397 kw Worthington dual-fuel engine generating units. Two old units were removed as was the entire forepart of the old building structure and a new brick addition replaced it to house the new equipment at the plant.

In deciding upon the areas allocated for the new units, consideration was given to future expansion. The cooling tower was located in the northeast corner of the property with waterlines to and from it routed so as to allow the installation of additional tower sections in the future. An area paralleling the new engine generator units, and extending back 50 feet from the front of the building, was kept clear of all accessories and pipes so that new

* *Asst. Chief Engineer*
A. M. Lockett & Co., Ltd.



Maxim exhaust silencers are mounted on supports above the self-cleaning American air filters. Behind Ross heat exchangers can be seen fuel day tank with meters and float control.

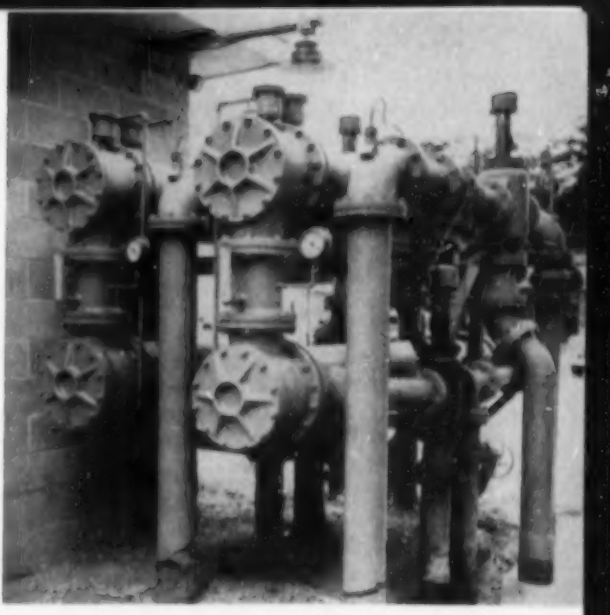


View of two Worthington SEHGO-8 engines with Electric Machinery generators. Floor mounted gage and alarm panel for one engine is to rear. Switchgear is in a bay to the left. Woodward governors, Elliott turbochargers, and Young aftercooler can be seen on engines.

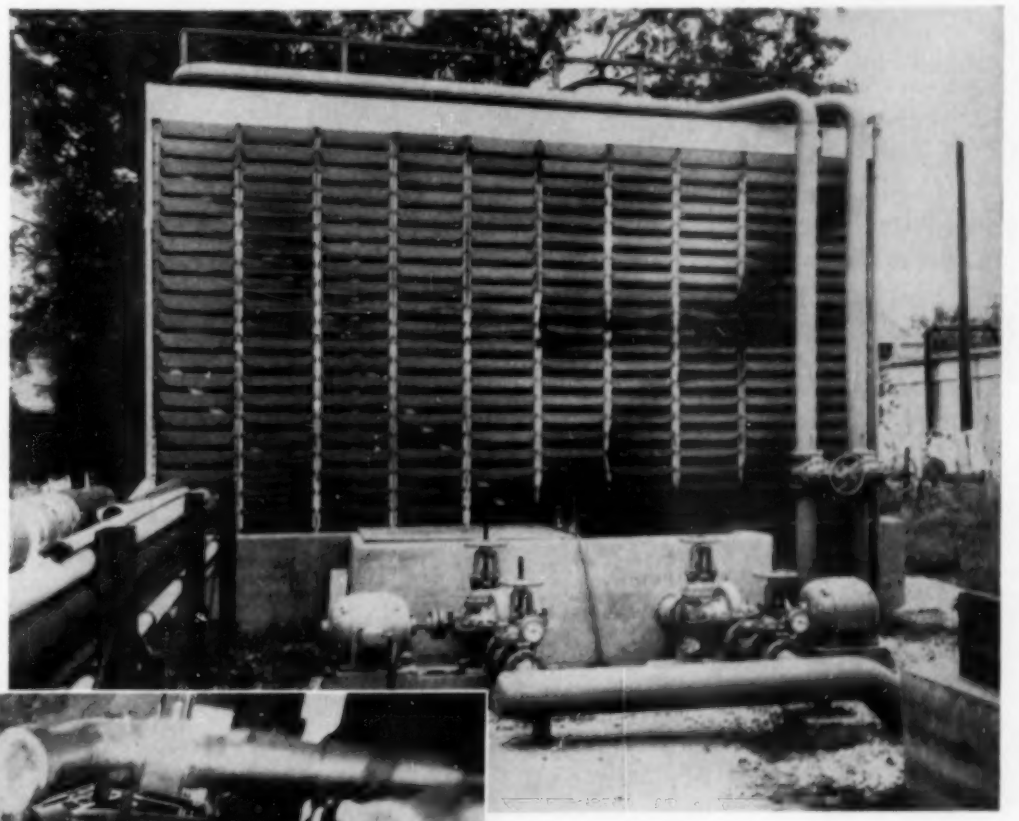
units can be added and the building extended in the future without interference with the newly installed equipment, and without interruption of service. While this made planning more difficult for this installation, the Town of Franklin can look forward to a well arranged power plant for several additions and many years to come.

The Worthington engines are 8 cylinder 16 in. bore by 20 in. stroke turbocharged four-cycle dual fuel units rated 1975 bhp and capable of carrying this load continuously with an ambient air temperature of 105° F. Each drives an Electric Machinery generator rated 1397 kw at .8 power factor. The engines are of the latest four valve head design and are equipped with the usual Worthington dual-fuel features including: dual plunger fuel-injection pumps to provide for pilot oil service and, if necessary, full diesel oil operation; individual and adjustable gas metering valves under governor control; thermal air control for maintaining a constant air-fuel ratio at varying loads and therefore maximum fuel economy; and automatic fuel switching equipment to change over to full oil operation if there is a failure of gas supply.

Following completion of installation work, tests were run by the Consulting Engineers. The gas meters were calibrated and the diesel oil was weighed. To assure accurate results, gas samples were analyzed by the gas company and in addition gas samples and diesel oil samples were analyzed by an independent testing laboratory to determine high and low heat values. Results were as follows with no tolerances allowed:



Individual Ross heat exchangers with jacket water above and lube oil below have three-way Fulton-Sylphon thermostatic valves for temperature control. All piping below ground is given protective covering.



Marley double section induced draft tower with Worthington raw water pumps are located to allow future extension.

UNIT NO.	KW. LOAD	FUEL USED	PILOT OIL BTU/ KWH	GAS BTU/ KWH	TOTAL BTU/ KWH
1	1400		379	9,149	9,528
1	1050	Dual Fuel	530	9,111	9,641
1	700		811	10,230	11,041
2	1400	Dual Fuel	370	9,187	9,557
2	1050		497	9,319	9,816
2	700		790	10,449	11,239
1	1400				10,160
1	1050	Oil			9,931
1	700				10,135
2	1400				10,159
2	1050	Oil			9,909
2	700				10,011

Perhaps the most pleasing feature to the Town of Franklin was the low pilot oil consumption of only 4% of the total btu/kw requirement at full load. With diesel oil at 9½¢ per gal. and natural gas at 22½¢ per thousand cu ft, these two engines, using 4% pilot oil, would save the Town of Franklin $4,150.00 per year over engines consuming the same total btu's per kilowatt but requiring 8% pilot oil. This is based on operation of the two engines at 75% load for 8000 hours per year. This is a sizable saving as it represents a 6% return on an investment of nearly $70,000.00. Ten per cent overload was carried comfortably and the fuel switcher was tested out and it was not possible to detect the change either by ear or by watching the switchboard instruments. These new engines now produce 95% of the plant output. And so it is fitting that the town established in 1808 by Alexander Lewis of Pennsylvania and named for his friend Benjamin Franklin should have a most modern and dependable electrical generating station.

List Of Equipment

Engines–Worthington SEHGO-8 Cyl., 16 in. x 20 in., 1975 bhp @ 360 rpm

Alternators–Electric Machinery 1748 kva, 1397 kw, .8 pf, 3 phase, 60 cycle, 2400/4160 volt

Turbocharger–Elliott

Governor–Woodward

Lube Oil Filters–Honan Crane

Cooling Tower–Marley

Exhaust Silencer–Maxim

Air Filter–American Air Filter

After Cooler–Young Radiator

Switchboard–Westinghouse

P•I•E OPENS NEW DIESEL SHOP

By JAMES JOSEPH

WHAT is likely the U. S.'s largest truck overhaul base—a 68,000 sq ft radiantly-heated shop designed to service some 300 diesel rigs daily—has been opened in Los Angeles by Pacific Intermountain Express. Linked to the new shop is PIE's new 705-ft long terminal, geared to handle 2 million pounds of freight daily (via towveyor system) and to load-unload 144 trailers simultaneously. The shop, assigned service on all over-the-road rigs operating west of Denver, in addition to Los Angeles-area in-town trucks, has three prime jobs: (1) handle lubrication and minor maintenance for pickup and line-haul equipment; (2) do major overhauls on tractors; (3) do major maintenance on trailers.

Statistically, the shop can completely overhaul up to three diesel rigs daily, put two reconditioned trailers back into service, and run 300 minor-service jobs thru every 24 hours. Handling the chore around the clock are some 400-500 staffers, 300 of them mechanics. Comparatively, PIE's famed Denver shops schedule about 140 service jobs daily, employ at maximum 400 people, about 250 of them mechanics. Unlike many a diesel maintenance shop, PIE's is designed (except for trailer overhaul) for straight-through service. Or, as one shopman puts it, "it's in one door, out the other." Whether scheduled in for routine lubrication or major overhaul, rigs process in one door, move down an automated service line, exit the shop's far end, ready for the road. There are no stalls—nothing to impede the steady production-line flow of maintenance. Nor are there any fixed benches on the service floor to slow servicing. PIE floors some 250 mobile, caster-wheeled tool benches which mechanics can move right along with the rigs processing the line.

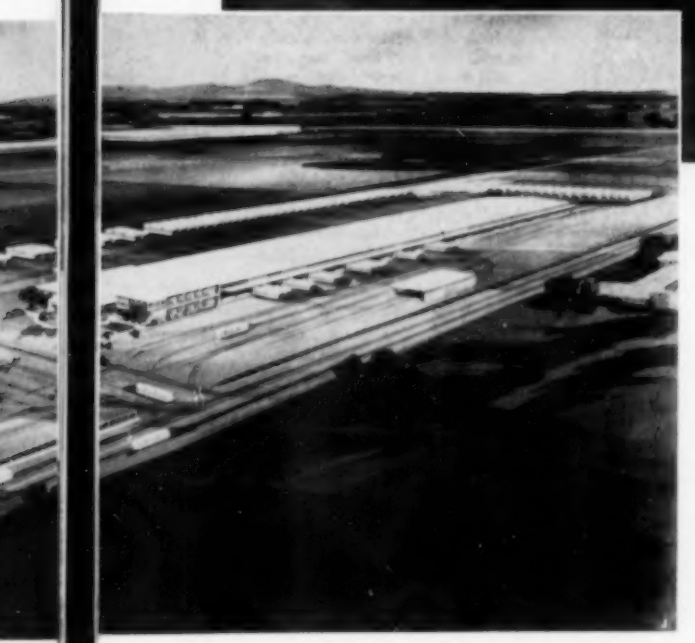
Typical is the service department, which routinely checks every PIE tractor at trip's end. Department's four 70-ft long, recess-lighted pits can handle 200 lube jobs every 24-hours, up to 300 if pushed. Every 15-minutes a lube job comes off the pits. Each pit is unitized—is self-sufficient, complete with all utilities (air, water, grease and fuel oil). 70-ft pits—ten feet longer than at PIE's Denver shops—are an innovation. Reason: so that even when servicing a road-limit 60-ft rig, five ft at each end of pit is open, allowing mechanic easy access via end-pit stairways. At Denver, road-limit rigs sometimes make it difficult for mechanics to get under-chassis. Another innovation are angled service aisles. Instead of being laid out straight, service aisles, coming off the pits, are angled 45-degrees—this to allow rigs a choice of service lines. Reason: so rigs needing most maintenance can be shunted to a specialized, slow moving line, while those requiring only routine work can move quickly thru and out of the shop, unimpeded by the rig ahead. Says PIE's Jack W. Riesing, Director of Fleet Maintenance, "angling may seem a pretty obvious idea. Yet, simple as it is, we expect it to keep servicing on a production-line basis."

Factory-like maintenance is possible for PIE because traditionally it standardizes, uses but a few basic type rigs. And most of them—perhaps 90 per cent— have Cummins engines, from 175 hp turbocharged JTs to 250 hp pancake engines powering its XD tractor series. Angled lines, because they give rigs coming off the pits a choice of service aisles, have yet another advantage: they can be specialized. Thus, one of the shop's five lines is installed with a Clayton dynamometer, for trouble-shooting vibrations, power squawks or sick engines. If driver has reported no trouble, rig is shunted to a faster-moving, routine service aisle (all aisles are

Artist's conception of P-I-E's sprawling Los Angeles terminal and maintenance shops (shops, left).

Three of shop's five, 45-degree angled maintenance lines at exit end.

Angled maintenance—note how service lines come off pits (background) at 45-degree angle, to speed flow of maintenance.



25-ft wide). If trouble is indicated, the rig moves to a trouble-shooting line.

The big Clayton dynamometer has been modified by PIE engineers, installed with mirrors so its control board can be read from a tractor's cab as a mechanic test runs the vehicle. Control board is fully diagnostic, recording: (1) fuel flow to fuel pump; (2) exhaust pressures; (3) vacuum at intake manifold; (4) engine rpms; (5) fuel temperature; (6) fuel pressure and (7) speed, in mph. Monitoring each pit is a Granco fuel meter. And nearby stands a Hobart recharger, which on a single rack can charge 16 12-volt batteries or 32 6-volters. Along aisles (as over pits) hang utility drops—air, grease and electritity, both 110 and 220 volts. Radiantly-heated floors, as at PIE's Denver shops, keep mechanics warm, drastically reduce complaints of arthritis and backache. As at Denver, the Los Angeles service line specializes—uses No. 140 gear grease for chassis (Mil 2105) and SAE 30, heavy detergent oil (Mil 2104). Working each pit is a diesel mechanic. His job: to inspect rigs as they come thru, write-up a service work order. Previously, at Denver, inspections were made after the pits, by a mechanic using a creeper. Inspection-from-pits is not only faster but more thorough. Tractor's average time in and out of service shop is 45 minutes.

But perhaps PIE's most notable maintenance achievement is its overhaul shop, this, backed by a stock room shelving a $150,000-$175,000 parts inventory. To the overhaul shop come tractors after every 180,000 miles (D check) and again at 360,000 miles (E check). D and E checks differ in that for the D check, major assemblies are stripped off and dismantled. On the more extensive E check, the rig is stripped to its frame—the frame sandblasted, and run thru the shop's paint booths. Like the service department, the overhaul shop processes tractors down a production line, aims at complete overhaul of from one to three units daily. Some 17 specialized feeder departments—each specialized to a specific tractor component—are grouped along either side of the line. Along one side lie heavy assembly shops—repair sections specialized to radiators, front ends, rear ends, clutches, transmission-differentials and engine rebuild. Along the other lie light assembly sections—specialized to pistons, rods, rockers, heads, electrical and metal-working, plus Magnaflux inspection and welding. Nearby are the overhaul department's two big dry-type paint booths, each large enough to house a tractor and its cargo box. One of these is installed with infra-red drying lamps.

When a rig comes in for either D or E check, its assemblies are stripped, sent to a nearby steam-cleaning station. Here, a gas-fired Malsbary cleaner, rated 1,500,000 Btu/hr, does a quick job of the preliminary cleaning job. Pistons and sleeves (as many as 60 of them in one batch) are basketed, hoisted via an overhead, 6000-lb electric hoist to a Detrex Corp degreaser. For deburring and de-carbonizing a wide range of carbon-prone parts, PIE has installed a Vapor Blast unit, similar to one which proved so successful in the trucker's Denver shops. Pistons, as one example, are trayed (as many as 6 pistons and their sleeves to a tray), run thru the Vapor Blast. Here, one man, rubber-gloved and directing the liquid honing hose, can de-carbon a tray of parts and spray them with a rust inhibitor, in something less than 20 minutes. PIE has long used Vapor Blast—now, at its new Los Angeles shops, installs the process as maintenance's most efficient de-carbonizer. While such components as sleeves, injector caps, pistons and the like are processed by Vapor Blast cleaner, other parts, stripped from the tractor, are each being reworked in shops spaced along the overhaul line. Immediately down the line from the Vapor Blast department lies the radiator section, complete with a big water tank where radiators are

Like service shop, overhaul department is straight-line production; completely overhauling as many as 3 units daily.

leak-tested under 5 psi air. There's a front and rear end section, with a Dake 70-ton hydraulic press, its job to press out bushings, bearings and shafts.

The shop-within-a-shop layout follows a tractor's tear-down and reassembly schedule. For rigs, in for repair, move down the assembly line, picking up rebuilt or new components from each line shop. Thus, near overhaul's end, lies the dynamometer department, installed with a Clayton dynamometer. Engines are lifted into the test rack by a P&H Hevi-lift, 4000-lb hoist. And next in line after the engine test is the injection department which also reworks fuel pumps. A PIE designed fuel pump test-stand can handle all three types of pumps (Standard, Cummins DD and PT). Along one of shop's walls is a steel rack, fitted with steel pins, from which fuel pumps hang, out of the way and ready when needed. Rack accommodates up to 12 Standard pumps 16 DDs and 16 PTs. Near overhaul line's end, across from injector-fuel pump room, lie the paint booths and isolated welding section. Curtained by tarps from the rest of the reassembly line is the welding shop, equipped with acetylene, arc and heliarc welders. The arc unit is a 29 amp, 440 volt Lincoln Shield-Arc and the heliarc is a Miller Model 207, 230/-460 volts, 144/72 amps.

Radiantly-heated floor in service shop isn't clogged by any fixed benches. Rather, all tool chests and work benches are mobile, as this one here.

In overhaul shop, Vapor Blast liquid honing machine decarbonizes diesel engine parts.

Only the trailer overhaul area has stalls contrasting to the shop's otherwise production-line layout. Here, 8 trailers can be worked simultaneously, their refrigeration motors (if any) repaired via a portable scaffold. PIE's aim, initially, is to turn out one ready-for-the-road trailer every day, up to two a day if necessary. Of PIE's some 2900 pieces of equipment, probably 90 per cent will be overhauled and routinely serviced in the new Los Angeles shops which consolidate three PIE repair facilities formerly operative in the L A area. These were PIE's old Los Angles terminal, shops of West Coast Fast Freight (recently merged with PIE) and PIE's Tanker division terminal and shops, formerly at Downey, Calif. With the majority of its 394 line-haul diesel tractors and tanker trucks scheduled for servicing in the new shops— in addition to 1250 dromedaries and line-haul trailers—PIE has moved into the shop its renowned engineering department, and also, its diesel-wise Director of Fleet Maintenance, Jack W. Riesing. Denver continues to overhaul rigs operating Denver east.

As for the multi-million dollar installation, Riesing shrugs, "I know a lot of fleet owners have been used to talking in superlatives, looking over our Denver shops. But here in Los Angeles we've built a maintenance headquarters, now PIE's principle overhaul facility, that goes far beyond the Denver operation. We've incorporated everything diesel-worthy from Denver, and added a lot of new ideas. But it's more than a show place. It's an overhaul production line like any factory's."

DROPS OF WATER AND GRAINS OF SAND

Warner Company's Tugs Get Lost in Fog on a Lake Made by Dredging Sand and Gravel and Hauling it Away with Dieselized Equipment.

By ARNOLD B. NEWELL

THE story of the Warner Company has been told many times in many ways for it is a big company with its roots deep in the soil of Pennsylvania and a 162-year heritage of navigation extending via sailing vessels from the Delaware to the West Indies. Currently, the story links itself to great engineering and construction projects and the delivery of Central Mix Concrete in quantities such as half a million tons to the Delaware Memorial Bridge, 700,000 tons to the Pennsylvania Turnpike and 1,400,000 tons to the Great Fairless Steel Plant of the U.S. Steel Corporation which is not far distant from the sand and gravel production area of Van Sciver Lake, the Warner terminal plant at Pennsbury, the Morrisville General Offices and a Central Mix Concrete plant in the same area. The fact that this is a diesel story is not what first attracted me to it. One day I was chatting with my old friend Tom Bowes in his office in the Lafayette Building, literally surrounded by the vast collection of models of boats of his design, and he said the Warner Company owned Van Sciver Lake in Bucks County. On it they operate some diesel driven tugs of his design and by dredging sand and gravel the lake became so big that the tugs got lost in the morning fogs of the region. Navigation by magnetic compass was out of the question with the electrified Pennsylvania Railroad running along the shore of the lake. The tugs were small and hardly warranted the installation of a Gyro-Pilot. Radar eventually solved the problem. It seemed to me it would take a lot of digging to make a lake big enough for tug and tow to get lost en route from dredge to terminal.

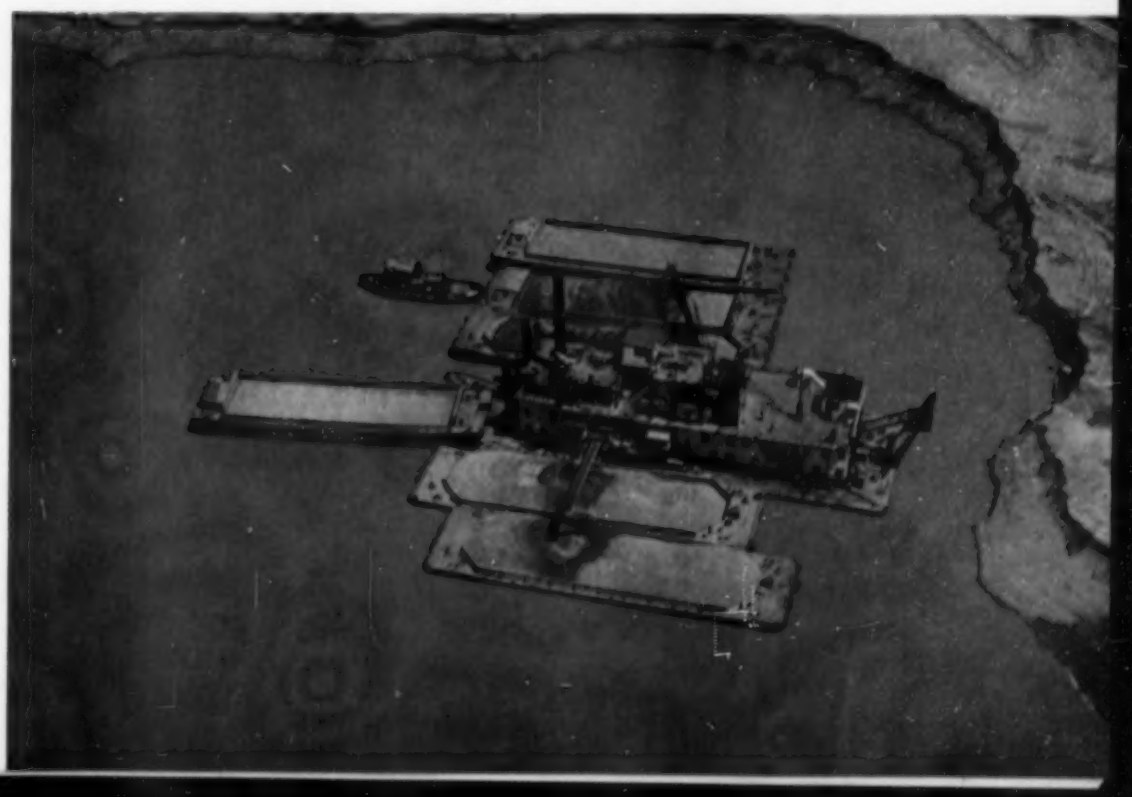
Upon visiting the plant I found four diesel locomotives and 76 hopper cars on a private railway operating on about five miles of track connecting the various Warner plants in this area and transporting more actual tonnage than many main line railroads. All the locomotives are of switcher type, two are Baldwins, one is a General Motors, each using the builder's own make of diesel and one General Electric powered by a Cat D-17000 engine. The company has its own maintenance shop for rolling equipment, located at the Van Sciver plant. Trains make a trip every 30 minutes from plant to terminal. Not all the power is diesel. However diesels are used where they are best suited to the work in hand and more will be employed as further engineering advancements result in displacement of the equipment in need of modernization. Later we shall come to Delaware River operation, but in the meantime utilization of dieselized equipment in Morrisville is of interest.

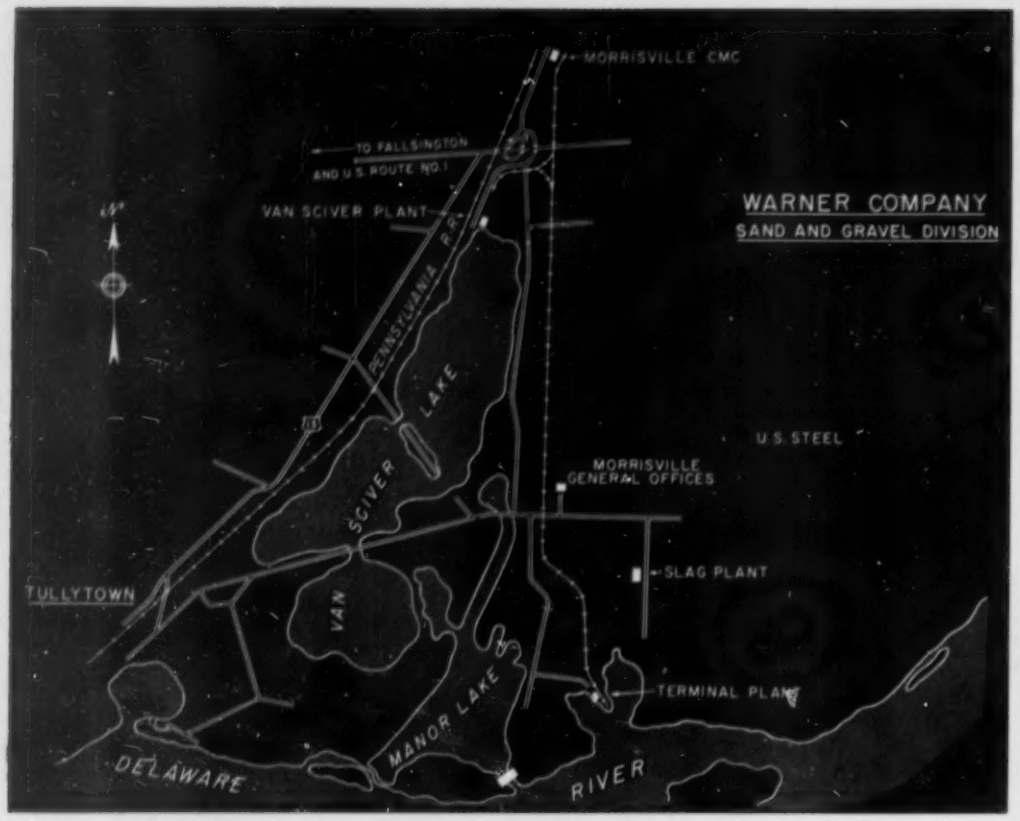
Van Sciver Lake has been dredged to a depth of water ranging from 25 to 40 ft from a grade about 10 ft above the lake level which is maintained at uniform height by pumping water first from the Delaware into Manor Lake and then into Van Sciver which is a little over two miles long and about half a mile wide. The dredge on this operation is electrically driven. Two tugs on the lake, the *Vanguard* and the *Victory* are powered by Caterpillar D 386 diesels while the *Vanity* is powered by a Cat D 17000. Barges loaded with bank run gravel are towed by these tugs one at a time from the dredge to the plant for screening, grading, washing, etc. The trips consume about 25 minutes each. Everything is used. Even the tailings are ground into crushed stone and plasterers sand is salvaged from what used to be wasted silt. Mountainous stockpiles are built up along the Warner railroad for reserve supply to be drawn upon in winter when the dredges are inoperative. There are three locomotive cranes, each powered by a GM 6-71 diesel. These cranes are used in the movement of aggregates. A fourth of considerably more power is equipped with a Cat D 17000. A floating crane is used for stripping and blending.

While a portion of the output is transported to the near-by Morrisville Central Mix plant and finished materials are moved out in quantity by the Pennsylvania Railroad, the vast bulk is transported by the Warner railroad to the Terminal Plant on the Delaware where the sand is dropped out of the hopper cars directly into barges and the gravel is rewashed before loading on barges, then both are towed to one of the various distribution points along the river, or stockpiled to be drawn upon later. A small tug powered by a GM 6-71 spots barges at the terminal. Of considerable significance in this account is the fact that the operation as described thus far is one of first dredging, then towing, then processing and grading at a shore plant, then transporting to the terminal plant on the Delaware River, via Warner railroad.

On the Delaware there is an entirely different operation in the form of the dredge *Franklin* which by a sort of evolutionary process has been largely dieselized and is destined to be fully equipped with diesel sooner or later—probably sooner. At present, this dredge has a GM 8-268A, GM 6-71 and a Superior GDB-8 driving a 100 kw generator. At first the diesels supplemented the original steam plant, but with more diesels added steam now supplements the diesel engines. Incidentally, the *Franklin* was purchased some years ago at Pittsburgh, Pa. Some of the equipment was shipped by rail

The dredge *Franklin* digs and grades 600 tons of sand and gravel hourly. By degrees the steam power of this dredge has been displaced with diesels. Each barge carries 1000 tons.





Manor Lake was dug first followed by the Van Sciver Lake dredging but the two will not be joined. The Warner standard gauge railroad extends from the Morrisville CMC plant to the Terminal plant.

but the hull was towed down the rivers and picked up at salt water by Moran diesel tugs for the coastwise trip to Philadelphia. The interesting feature of the *Franklin* is dredging and grading in a single operation afloat. Barges put along side the company's diesel tugs are loaded with sand or gravel to meet end requirements of the customer or the central mix plants. This huge dredge delivers 600 tons of six kinds of aggregates hourly to the barges. If its capacity exceeds current customer demand the output is moved by tug and barge to the terminal plant for stockpiling.

This gives us a general picture of what takes place within a company that was started in 1794 by John and William Warner and has remained in the family ever since then. Now the fourth and the fifth generations of the family head the company. There are six large mix plants, one in Wilmington, Delaware, four in Philadelphia and the one already mentioned at Morrisville. Production of Central Mix Concrete alone amounts to over a million cubic yards per year. The company employs 1400 persons, has 3000 stockholders and the gross revenue is about $25,000,000 per year. The first start in the current business was made with a sailing vessel which took a crew of men with planks and wheelbarrows across the Delaware from Wilmington to the New Jersey shore and loaded plasterer's sand from the beach at low tide. In this way about 250 tons a month was produced as compared to 600 tons hourly of graded aggregates dredged by the *Franklin* alone. Around the turn of the century the huge Bucks County sand and gravel deposits in the vicinity of the Van Sciver plant were acquired making a total of 6000 acres, much of which is held in reserve for several decades of future use. At present, 3000 acres are

Photo by courtesy The Evening Bulletin, Philadelphia.

leased to the great Kings Farms for vegetable production. The Warner Company has many facets and many intensely interesting elements in its history and its operation. One of the most interesting is the chance purchase of the country home of William Penn with acquisition of the 6000 acre tract. When this fact was brought to the attention of officials of the company the Penn home at Pennsbury was promptly deeded to the Pennsylvania Historical and Museum Commission and the arrangement of commercial operation was made in a manner to leave the surrounding grounds in their original beautiful setting.

The tale of a so called conveyor belt will be an account of a dieselized fleet on the Delaware and we shall come to it in a subsequent issue. It treats of tugs and towboat each doing about 20,000 miles per year. There is another diesel story in the production of hydrated lime at the Cedar Hollow Lime Company plant acquired in 1900 for the then difficult-to-raise price of $40,000 and another at the American Lime and Stone Company plant at Bellfonte purchased after the bankers for

Diesel trains on the Warner railroad make a trip every 30 minutes and move more tonnage than some main line railroads. This one is a 660 hp Baldwin switcher.

The Warner terminal plant is shown between the Fairless steel mill in the background and the Country home of William Penn in the foreground. Note the train of hopper cars on the bridge over a barge being loaded. The harbor was dredged by Warner and the sand and gravel sold. The booms on the cranes are nearly as long as the 1000 ton barges.

that company urged Warner to step in and put it on its feet. And still another diesel use cropped up within the company when the Slag Plant was set up to utilize the waste product of the Fairless Steel Mill which had purchased so much of the Warner output for its construction. Curiously, this supply of a new kind of raw material near at hand was accompanied by more river traffic to the steel mill, forcing Warner to improve its boats which is a good thing now that the highway program is starting and even greater demands will be felt for the products of this leader in its field.

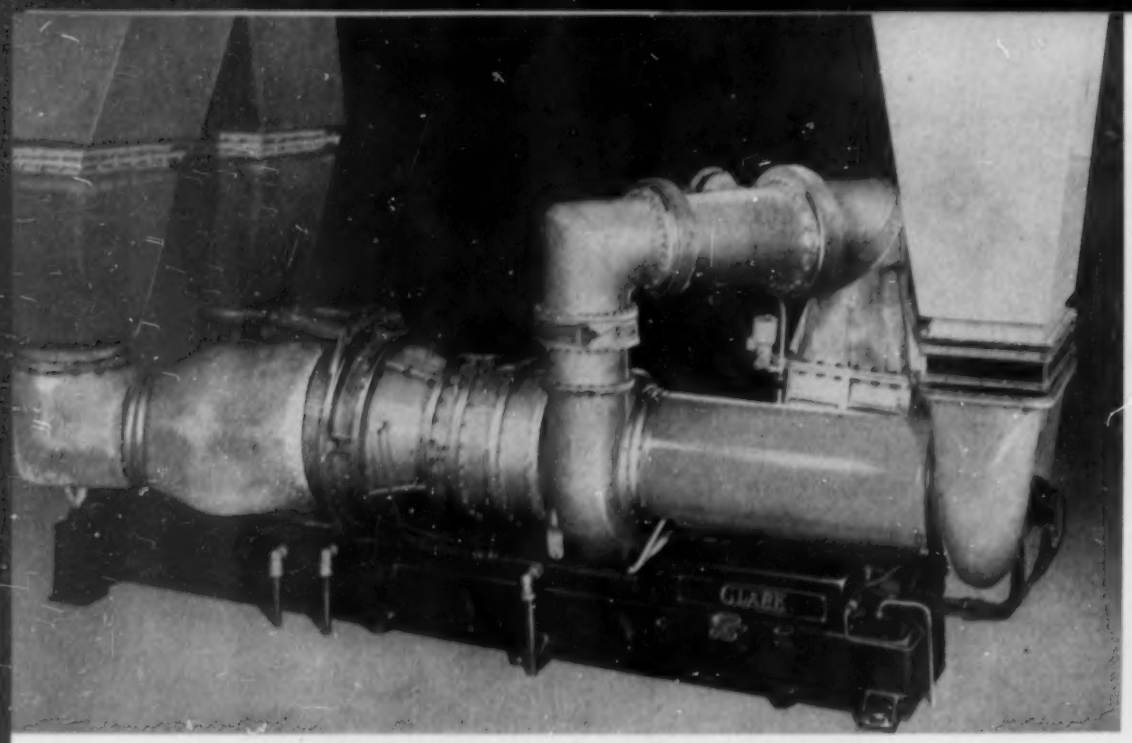
While some people might say the Warner Company of Philadelphia has a Midas touch this is incorrect. What they have is the courage to take advantage of opportunities as they arise. A case in point is the Black Top Operation at the Slag Plant just mentioned. It was, of course a fortuitous circumstance that a site so near Warner's Van Sciver Lake and Morrisville sand and gravel enterprise was chosen as the location of a new steel mill, thus establishing an additional supply of raw material. In this black top operation it is necessary to handle vast quantities of slag which somewhat resembles lava with its extreme porosity and therefore low specific weight. As it comes from the steel mill it is in fairly large pieces which are passed through a crusher at the Warner plant and reduced to sizes suitable for the paving in which it will be used. As is to be expected, this too is a diesel operation for the Warners are not prone to waste power nor the fuel with which it is produced. For example, one of the first moves when they took over the Cedar Hollow Lime Company was to switch from wood to coal firing and reduce the fuel bill 50 percent. Up to then wood was considered better as fuel for the kilns.

In the slag and asphalt project seven Euclid trucks are used. These are powered by Cummins NHIS 600 diesels. In two 2½ yd. Koehring shovels the same make and model engine is used. There is also a Koehring crane powered by a GM 6-71 while a 2¼ yd. Michigan front end loader is equipped with a Waukesha and they also have in this operation an International Harvester TD 18 dozer. It is worthy of note at this point that special facilities are provided at the Burks Street Terminal in Philadelphia for the maintenance of all diesel engines powering the equipment in the various divisions of the company. As a general rule no attempt is made to salvage or re-use engine parts when worn. New replacements are obtained from the engine maker and installed as needed. An exception to this is cylinder liners sent to Van Der Horst for restoration by Porus-Krome process.

Speaking of the by-products of the Warner operation we envision community benefits not originally planned. On the accompanying map, Manor Lake is a finished project. It will not be expanded. It is used for boating, fishing and swimming. Not far away a great real estate development, Levitown, is spreading over the countryside and it is evident that a highly populous, extensively industrialized region is being developed and in the midst of it Warner has 6000 acres eventually to become a series of lakes benefitting the community at large even more than the sale of sand and gravel benefits the stockholders of the company. In the meantime land clearing and stripping operations in preparation for the slow movement of the dredges requires more diesel driven equipment. The King Farms referred to previously, employ mechanization for soil and irrigation. Again, there is a community benefit of importance, this time in the form of a fresh food supply.

Editor's note:—This is part one of a two-part article by our Eastern Editor, Arnold B. Newell. He spent a few days at the Warner plant because diesels are the backbone of this huge operation. They are used successfully and economically to cut costs on the operation of tugboats, draglines, power shovels, switching locomotives, large trucks and electric generator drives. Part two of this series will appear in the November issue.

An American crane, powered by a Cat D 17000 diesel loads hopper cars at the Van Sciver stockpile.



The Clark Mark TA Gas Turbine is of simple open-cycle design. Developing 1130 Bhp, the Mark TA is an unusually light weight compact prime mover. It is ideally suited to stationary or permanent installations driving pumps, generators, compressors or other rotative loads. Heat recovery systems can be provided for maximum fuel utilization.

Both turbine and stator are readily accessible. Unit c
dow

NEW CLARK GAS TURBINE

By MICHAEL T. PATE

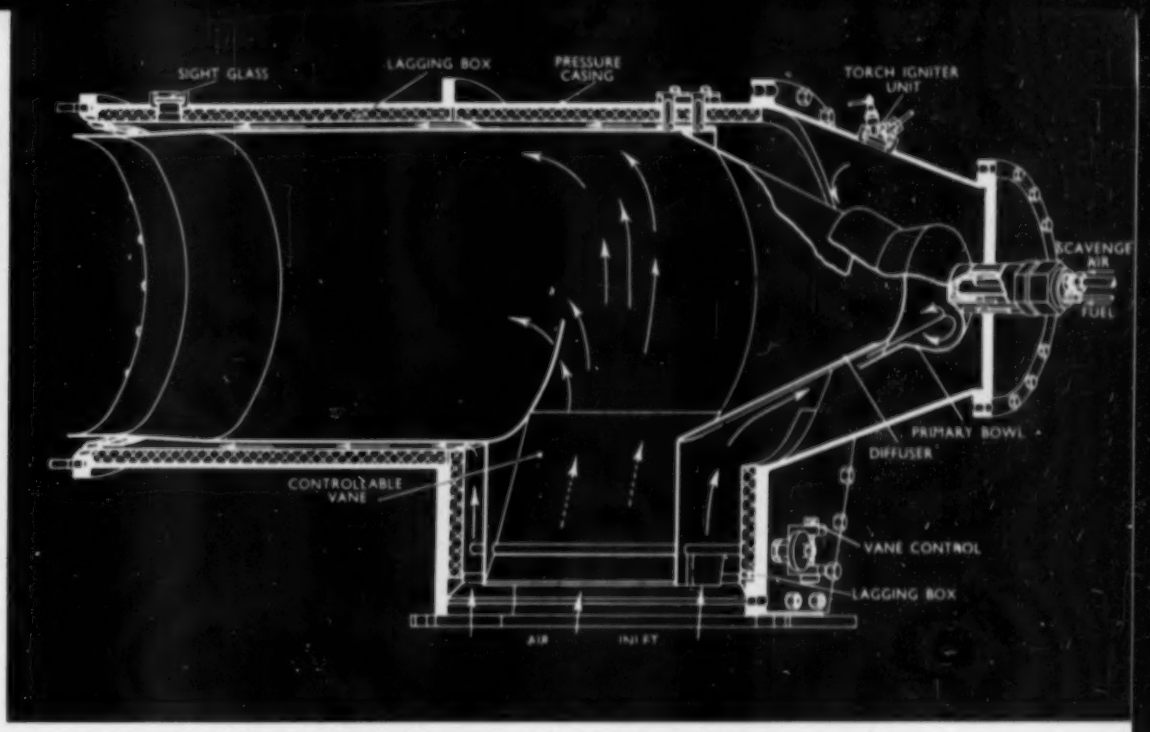
THE gas turbine, in the range from 3,500 hp upwards, has demonstrated its place in the power scheme for such applications as driving generators and powering natural gas line centrifugal compressors, and the small experimental turbine suitable for possible automotive drive has had some success. A new turbine, developing 1,100 hp when operating non-regenerating, and suitable for both stationary and portable installations is now manufactured in England by Ruston-Hornsby, Ltd., and arrangements have been made for the manufacture and sale of this unit in the United States, with Clark Bros. Co., already a successful manufacturer of large gas turbines, to handle both construction and marketing. The new turbine, designated by Clark as the Mark TA, is a dual shaft unit, with a single combustion chamber and dual exhausts. The primary shaft carries the 13-stage axial flow air compressor, an extension of the shaft through the intake air diffuser casting carrying the 30-hp electric motor which serves as starting unit. The high pressure turbine, a two-stage unit, runs at 11,500 rpm and is coupled with the compressor rotor through a gear type flexible coupling which allows angular flexibility while transmitting the torque from the turbine to the compressor.

The low pressure turbine, operating at 6,000 rpm, is also a two-stage unit, and is coupled to the exhaust from the high pressure unit by a flexible intermediate duct which absorbs expansion stresses, and which is readily removable. Exhaust from the high-pressure turbine is through two ports, 180° apart, which are connected through breeching to a single stack which admits of numerous variations to fit specific conditions. Use of internal lagging and cooling with an annulus between combustion chamber and housing make for a very smooth exterior, and at the same time keep down radiant heat. Only the exhaust breeching is externally lagged and this, in permanent installations—as contracted to portable set-ups—is also covered. The unit requires no water. The fabricated steel base serves as lubricant reservoir, with a separately mounted fin and tube type heat exchanger for cooling lube oil. In pipeline service, the lube oil can be cooled in a high pressure heat exchanger in the pumped stream, and the external cooling system can thus be eliminated.

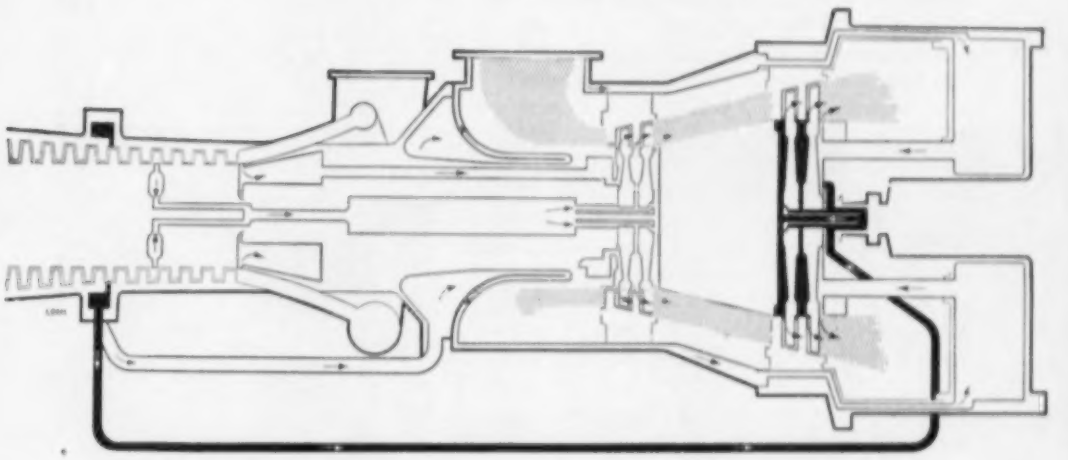
The start-up cycle is controlled through five positions of a handwheel mounted on the console which also carries the gauges and safety provisions. The rotor of the air compressor is turned by a 30 hp starter motor, at the same time that the 2½ hp motor starts the lube oil pump. Initial current draft from the 400 ampere hour starting battery is 1500 amps, falling to around 400 as the starting cycle closes. With the compressor rotating, fuel is admitted to the burner and with starter motor and combustion chamber both functioning, the compressor is brought up to a speed of 5,000 rpm, at which speed the starting motor automatically disengages. The compressor and high pressure turbine continue to accelerate until 6,000 rpm is reached, when the governor takes over. With the starting wheel set to running position the engine driven auxiliaries automatically take over, and the turbine quickly reaches operating speed. The unit, starting cold, will accept load within two minutes from start. The governor is a centrifugally controlled hydraulic type, with servo oil supplied from the main lube oil pump at 50 psi. Governing is through fuel feed control, whether operating on gas or diesel fuel. Protective devices prevent turning over the compressor without lube oil at the bearings; prevent ignition (if a gas-fired unit) before turbines, combustion chamber and all ducting have been purged with air from the compressor during the starting cycle; and shut down the unit automatically in the event of overspeeding or loss of lube oil pressure. The turbine and controls are such that full automation or satellite operation can readily be attained and the unit started, controlled and stopped without supervision other than that supplied in the controls at some remote spot.

Temperature and altitude affect this, as any other turbine rating. A 3.5% reduction in output is suffered for every 1,000 ft increase in altitude above mean sea level; with a 5% reduction or increase for each 10° F. above or below 80° F. On applications of this turbine where waste heat is

Unit can be inspected one hour after shut-



Single combustion chamber and burner permits the simplest possible arrangement without the matching difficulties associated with multiple chambers.



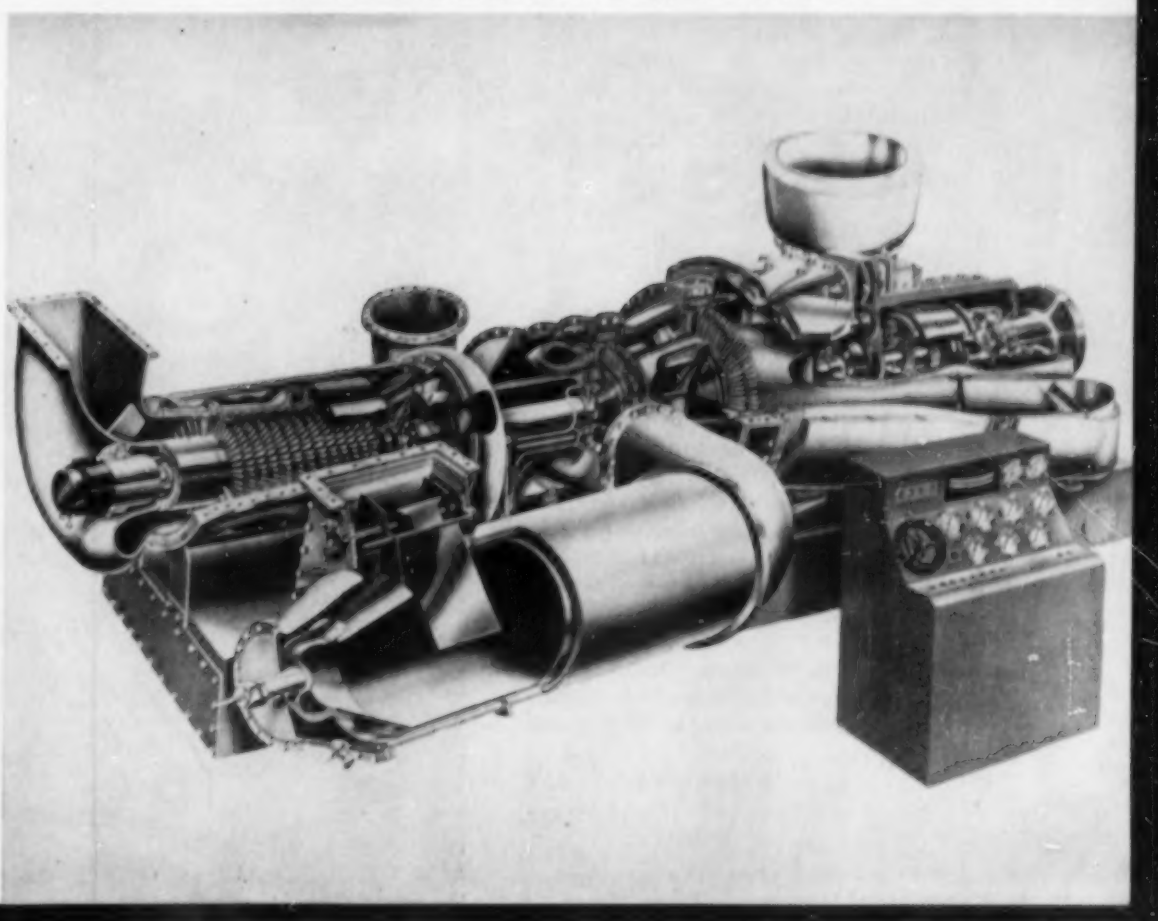
Air cooling system minimizes thermo stress and assures long life of components.

utilized, back pressure through a waste heat boiler influences power output as follows:

Back pressure at site, continuous rating- in. of water	2	4	6	8
Reduction at all loads, bhp	30	55	75	90

The turbine is designed for operation at a normal inlet temperature of 1,340° F. Combustion chamber linings are not required during the life of the turbine. The overhung turbine wheels can be removed without disturbing either shafts or bearings. The heaviest part normally handled in normal maintenance weighs only 500 lbs. Turbine stator casings may be removed for inspection of the blading without disturbing the intermediate duct. Either turbine or blades can be inspected within one hour from shut down. No turning gear is required for cooling the unit after shut down. Thin-walled steel-backed precision bearings are used, babbitt lined for the compressor and copper-lead for the turbines. Total weight of the unit is 6 tons, and with built-in lube oil reservoir and base, under 10 tons. For transportation, the unit may be split into three components, all well within normal transportation limitations. Clark Bros. Co., placed this new Mark TA turbine on public view for the first time late in July.

Cutaway view of the Clark Mark TA, 1130 Bhp, Gas Turbine.



HUGE BOTTOM DUMP TRUCK

By DWIGHT P. ROBISON

ONE of the world's largest bottom dump hopper trailers, powered by a 400 hp diesel tractor, has been unveiled recently. The 70-ton trailer in one load can carry 95 cu yds of coal, enough to overflow an average rail car. Designed and manufactured by the Marion Metal Products Company, the trailer is 47 ft 4 in. long, 12 ft wide and 13 ft 6 in. high. It is powered by a giant Model 803 Kenworth tractor designed and built by Kenworth Motor Truck Company of Seattle, Wash. The tractor is 11 ft 6 in. wide and 12 ft 5 in. high.

The complete truck sells at an approximate cost of $90,000 and was delivered by highway to the Beckley Coal and Coke Company in Nicholas County, West Virginia, about 75 miles east of Charleston. The 300-mile journey, with state highway department permission, took about three days. The unit can move at a maximum speed of 34 mph. Stretching out for a total length of 66 ft 5 in., the mammoth truck is now winding its way up and down the picturesque West Virginia mountains on Beckley's own network of roads. It is used to haul coal from the open seams high on the mountains to the tipple—a distance of up to seven miles downhill. From these loading hoppers, the coal is dropped into rail cars for transportation to steel mill furnaces. The truck then returns, empty, up the mountains for another load.

Rated at 95 cu yds at struck (water) level, the trailer will actually carry well over 100 cu yds when heaped. Empty, the trailer weighs 47,700 lbs, while the tractor weighs 50,920 lbs, a total empty weight of 98,620 lbs (almost 50 tons). Loaded with coal, the entire unit will scale at 238,620 lbs, or more than 119 tons. The big unit is the result of the constant search for more efficient, more economical production in the coal fields, enabling the transportation of more coal at less cost per ton mile. Manufacture of the trailer took about 60 days at Marion Metal, following from three to four weeks of engineering time. The initial drawing was made last November, and the detailed engineering drawings made in March of this year.

Kenworth's 803 tractor, with a V-12 Cummins diesel engine, torque converter and semi-automatic transmission, also features power steering for driving ease. It is the largest 2-axle standard production model offered by Kenworth. The only larger tractor ever built by Kenworth was the T-10 Transporter which pulls the Army's atomic rifle. The tractor was delivered to Marion recently from Seattle by railroad flat car on a trip of about three weeks. Mounting of the two units and final testing to get it ready for the highway trip to West Virginia, took more than a week.

Riding on dual rear wheels, the off-highway trailer is 13 ft 6 in. high at the front, tapering slightly to a height of 12 ft 8 in. at the rear. The tractor also has dual wheels on the rear axle. The driver sits high in the cab on the left side of the tractor, the roof of which measures 11 ft 9 in. above the ground. The trailer will be unloaded through two long hopper doors at the bottom, each measuring 26 ft by 2 ft, which open by gravity and are closed by air. Side panels on the trailer are fabricated of 8-gauge high tensile steel. Tires on the big vehicle are gigantic—18.00 in. x 33 in., 32-ply nylon, nearly 6 ft in diameter, and they are interchangeable, along with wheels, bearings and brake parts, between the tractor and trailer. With each tire weighing 965 lbs, the truck's tires alone weigh nearly five tons. The largest free turning universal hitch

This lovely 5 ft 1½ in. young lady can just about make the nearly 6 ft reach to the top of one of the 18.00 x 33 tires on this coal hauling trailer and tractor. The 70 ton, 95 cu yd capacity bottom dump hopper is working in a coal field in the West Virginia mountains.

A late model automobile is dwarfed by this mammoth bottom dump hopper trailer and tractor. The trailer is pulled by a Kenworth tractor powered by a 400 hp Cummins V-12 diesel driving through a Twin Disc torque converter and Fuller transmission. Overall length of the tractor-trailer is 66 ft 5 in.

made, weighing 2,500 lbs, connects the two units, with the trailer revolving around a 9 in. diameter spindle. The assembly undergoes constant lubrication by a special oil reservoir system. Unusually large air controlled brakes on both units each measure 26 in. in diameter and 10 in. in width, with eight shoes apiece. The rear axle on the trailer was forged from a 10½ in. square solid billet, turned down to 8 in. diameter at the ends, and it weighs 6,500 lbs. A sloping steel shield on the rear of the trailer protects the axle and tires.

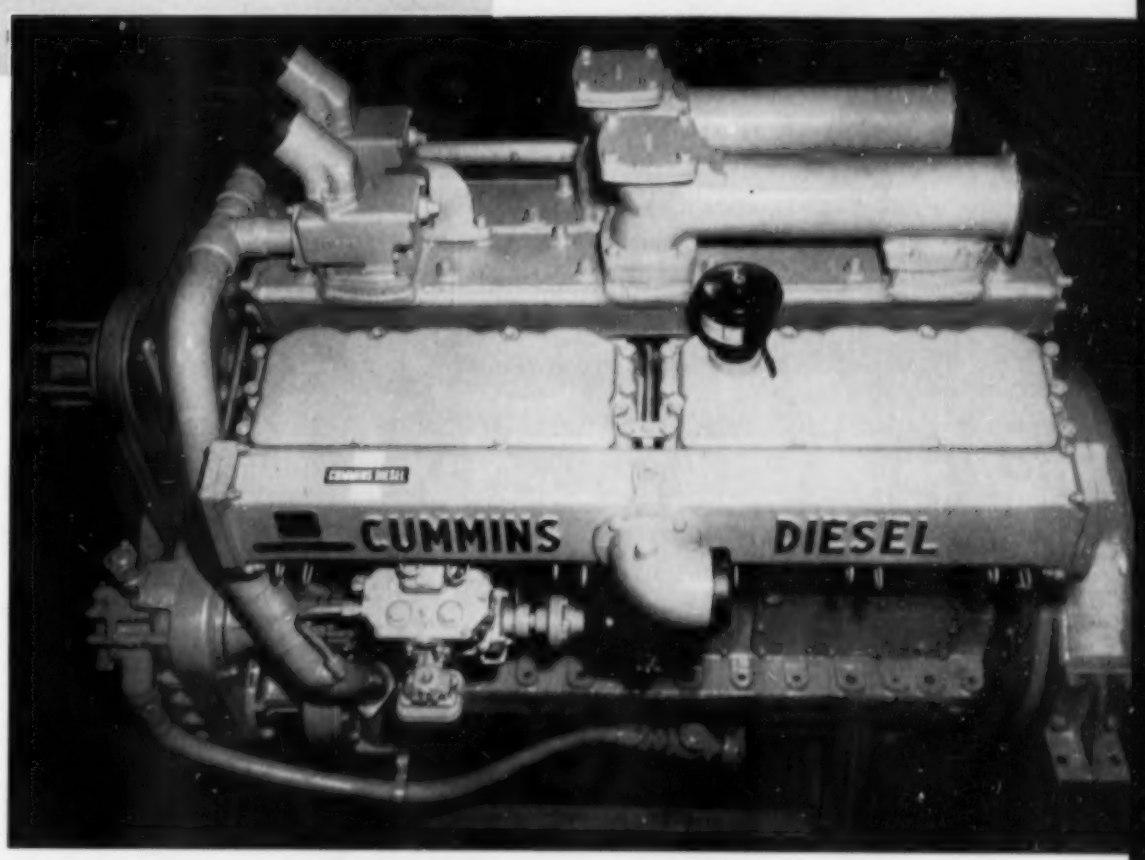
Closing of the two drop doors is controlled by a 10 in. diameter air cylinder with a 24 in. stroke. A 4 in. diameter cylinder with a 5 in. stroke trips the doors that fall by gravity. Door controls are mounted on the left side of the trailer, and are accessible from the outside by sliding covers. The doors have cushions to absorb the shock of the gravity opening. The free turning universal hitch allows complete freedom of movement between the tractor and trailer. The distance between the fuel tank and the hitch on the tractor is 7½ ft.

Kenworth designed and manufactured, the front axle of the tractor has a capacity of 50,000 lbs, rear axle 95,000 lbs, with a gross rating of 145,000 lbs for the tractor. The front axle has an I-beam center section of 8 in. heat treated alloy steel, 3 in. diameter king pins with nylon bushings, and

engine is beside the cab. It has a bore of 5⅛ in. & stroke of 6 in. and develops its rated hp at 2100 rpm. It is equipped with a Twin Disc torque converter, and a Fuller 4MS-1440 transmision.

The power steering system features a full circle steering arm and has two hydraulic cylinders, with the main cylinder exerting a force of 15,000 ibs. Control of the big truck was given special consideration by Kenworth engineers. The 803 has Kenworth's variable section frame—24 in. at its deepest section. Riding ease, both loaded and unloaded, is assured by a Kenworth springing system featuring unique variable rate front springs. As well as being rubber mounted at the ends, the front springs have steel seats set next to rubber to shorten their effective length when loaded. When unloaded, the truck rides on rubber. In a loaded position, the rubber block is relieved by flattening of the spring arch, and the result is a shorter, stiffer spring to compensate for the additional load.

Cummins V-12 diesel developing 400 hp used to drive the Marion coal hauling trailer and tractor. This engine is a compact package for its power output and drives the truck at a maximum speed of 34 mph.

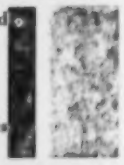


6 in. diameter spindles at the inner wheel bearings. The front axle has a track of 111½ in. Full floating, double reduction, planetary rear axle on tractor is equipped with 8 in. wheel bearings and constructed of special high strength cast steel.

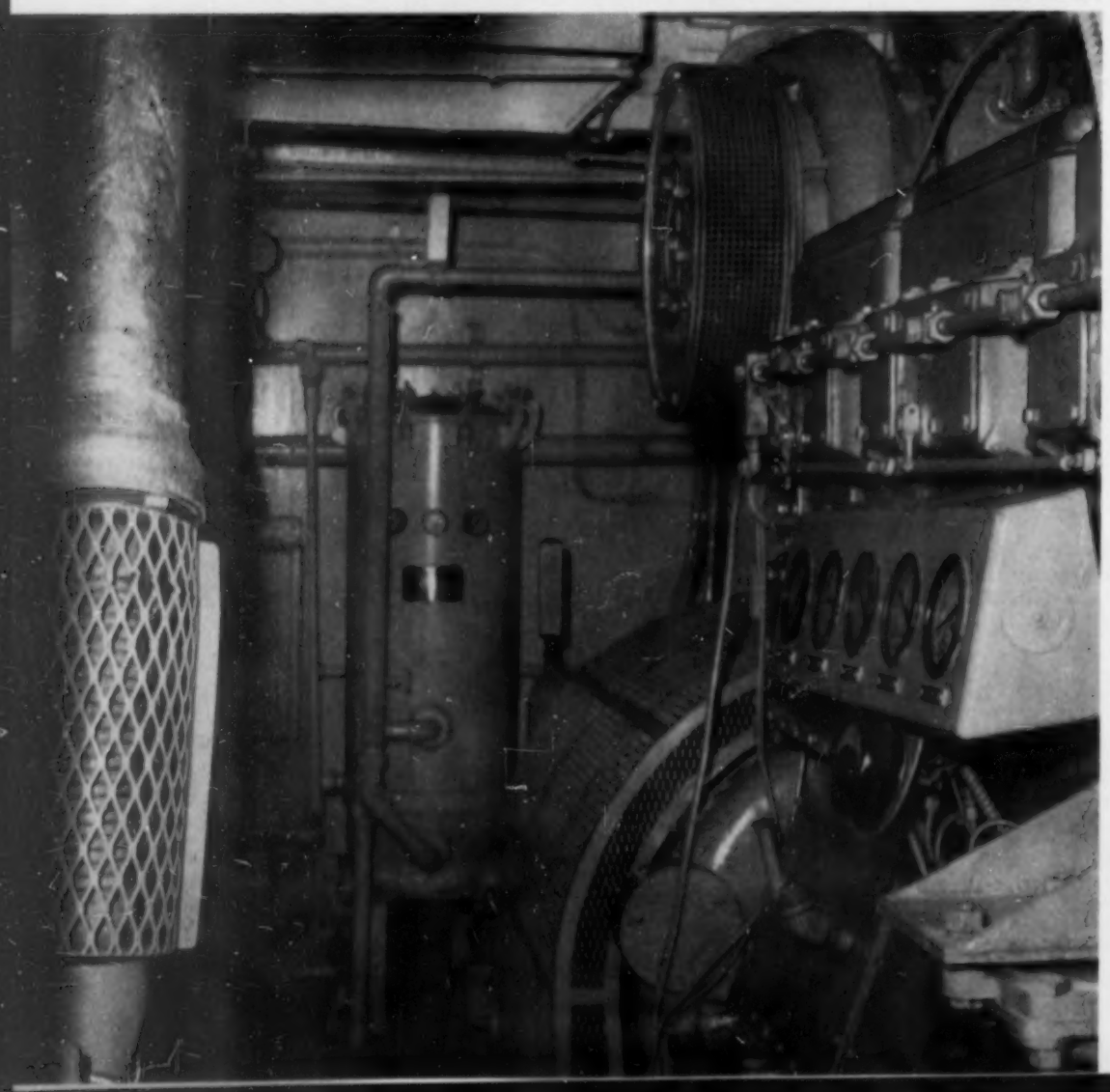
The tractor is powered by a Cummins diesel engine, Model NVHB1-1200, a V-12 of 400 hp. The

This truck is a notable engineering achievement and its existence is made possible by the Cummins V-12 diesel installed in the vehicle. This is an engine with sufficient horsepower plus compactness and flexibility to meet the requirements of the automotive type performance necessary in moving the tremendous loads over the network of roads in the West Virginia Mountains.

Dixie Spirit, built by Todd-Houston Shipyard for the Dixie Carriers of Houston and New Orleans packs 1000 hp in her 78′ long hull.



The compact turbocharger installation on one of the Enterprise 500 hp main engines can be seen here. Winslow lube oil filter is in background.



78-FOOTER WITH 1000 HP

By ARNOLD B. NEWELL

An interesting type of towboat the *Dixie Spirit* has been placed in operation between Houston, Texas and Nashville, Tenn., with an integrated tow of oil barges in the service of her owners, Dixie Carriers, Inc. of Houston and New Orleans. Of tunnel stern design and all-welded steel construction, the new boat presents a trim appearance in the manner of the modern pushers. The keel was laid the 25th of November, last year and delivery was made to the owners on April 30th, this year. Built to A.B.S. Classification and certified for Class Star A-1, Circle E towing service, the new towboat also complies with the various rules and regulations prescribed by government agencies.

The length is 78′, moulded breadth is 28′ and the depth moulded is 9′ 6″ while the maximum draft is 7′ 6″ and the gross tonnage is 170. The main propulsion engines, on twin screws, are a pair of 500 hp Enterprise Model DMM-383 turbocharged diesels driving a pair of 6′ diameter stainless steel propellers made by the Avondale Service Foundry. These engines are equipped with Falk Airflex reverse and reduction gearing with a ratio of 3:1. Auxiliary power is supplied by a pair of General Motors, Detroit diesels driving 30 kw generators, 120 volt, dc. Pilothouse control of the propulsion engine is through the medium of Westinghouse Airbrake equipment with compressed air furnished by a group of three Quincy, No. D 325 compressors for operation at 250 psi.

The *Dixie Spirit* was designed by Friede & Goldman, Inc. of New Orleans and built by the Todd-Houston Shipyard. Construction was supervised by Mr. H. E. Davis, Vice President in charge of operations of the Dixie Carriers, Inc. The boat was designed for maximum efficiency in intercoastal waterways and river services and to confirm this design before calling for bids, the naval architects had models built and towed at the model basin at the University of Michigan under the supervision of Professor Louis A. Baier. While the boat is not large, she is powerful and in another respect she has big-boat characteristics, namely comfortable quarters for the crew of 10 officers and men. The crew quarters, galley and pilothouse are all sheathed in Philippine mahogany. Pilothouse is equipped with a Radio Marine Corp. type 5-R 03 radar, radio telephone of the same make, the usual standard compass and a 19″ Carlisle & Finch searchlight.

SCOTT CITY, KANSAS

Fuel Costs Tumble To 2.69 Mills at Kansas REA Co-op. Four 3500-Horsepower Fairbanks-Morse Dual-Fuel Engines At Wheatland Electric Co-op, Scott City, Kansas, Deliver Dependable Power At Average Efficiency of 9,944 Btu/kw hr, Including Gas and Oil.

By DOUGLAS SHEARING

THE post-war years have changed the face of power in west Kansas and eastern Colorado. Prior to 1948, rural consumers in this area were paying premium rates for power from a struggling REA cooperative which was on the verge of bankruptcy. Today this same REA co-op is thriving and growing. Its demand is increasing at a rate of 500 kw per year. Its consumers are paying reduced rates, equal or lower than those of local public utilities and lower than most municipal power plants. Meanwhile, the once struggling co-op has constructed a new 14,000-hp generating plant which has become a showplace for the region and a model of efficiency. Its four 3500-hp Fairbanks-Morse dual-fuel engines are producing dependable power for a 2842-square-mile area at an average fuel cost of only 2.69 mills per kw hr. Chiefly responsible for this turnabout are sound investment practice and modern, efficient equipment. In 1946 the farmers and other rural consumers in the vicinity of Scott City were served by a number of small, scattered cooperatives, none of which was organized on a sound economic basis. The principal difficulty was the small number of consumers per square mile. In 1948, however, with the help of the Rural Electrification Administration, these struggling co-ops banded together and bought out Inland Utilities, a privately-controlled company which served only urban areas. One of the newly formed Wheatland Electric Cooperative's first acts was to construct a new generating plant at Scott City to serve the additional consumers acquired through the purchase, and to retire existing generating equipment to standby status.

The effects of this sweeping move were felt almost immediately. The new plant went on the line in the late summer of 1951 and in the remaining 5 months of the year recorded a respectable fuel cost average of 4.40 mills per kw hr. But this was only the beginning and the figure was cut to 3.17 mills in 1952. In 1953, fuel costs fell to 2.87 mills per kw hr, held at 2.88 in 1954, and in 1955 reached a record low of 2.69 mills per kw hr. The plant is currently paying an average of 19.5¢ per MCF for natural gas and 10.2¢ per gallon for pilot oil. The effect on total operating and production expenses has been equally striking. During the plant's first four months in 1951 these expenses averaged 6.3 mills per kw hr. By the end of 1955 they had dropped more than 27 per cent, to an average of 4.597 mills per kw hr. Included in these figures are the costs of plant operation, supervision, engineering, station labor, pilot oil, gas, lube oil, other operating supplies and expenses, labor and material in the maintenance and improvement of the plant structure, labor and material in the maintenance of generating and electrical equipment, rents, and other miscellaneous expenses.

The reasons given for the economic resurgence of REA power in this section of the country were wise investment and modern, efficient equipment. The wisdom of the decision to purchase Inland Utilities is borne out by the co-op's subsequent fiscal record. The efficiency of the four 3500-hp Fairbanks-Morse dual-fuel engines is indicated by these operating statistics, compiled from the plant's log books for the 12-month period ending December 31, 1955. In this period, the four dual-fuel units generated a total of 31,571,000 kw hrs, while consuming 142,645 gals. of pilot oil and 349,910 MCF of natural gas. The pilot oil used has a guaranteed heating value of 139,139 Btu per gal. and the gas a guaranteed heating value of 841 Btu per cu ft. Thus the four engines averaged 11.08 cu ft. of gas and 0.0045 gals. of pilot oil per kw hr throughout the period. Expressed in thermal units, they averaged 9,318 Btu per kw hr on gas and 626 Btu per kw hr on pilot oil—a combined average of 9,944 Btu per kw hr.

Fuel costs have been cut to 2.69 mills per kw hr and production costs, before depreciation and taxes, to a low of 4.597 mills per kw hr at this attractive REA plant in Scott City, Kansas. The steel structure houses four 3500-hp, 277 rpm Fairbanks-Morse dual-fuel engines and was completed in August, 1951.

Scott City is located in the wide open spaces of west-central Kansas, about 60 miles east of the Colorado border. Surrounding it are some of America's richest farmlands, hundreds of miles of flat amber waves of grain. For economic reasons, due to the sparcity of population, much of the region was without power until the REA stepped into the picture after World War II. As indicated previously, the first co-ops were formed in 1946, only to founder financially. As the first step toward economic stability, these small cooperatives were united under the Wheatland Electric Cooperative, incorporated on October 15, 1948. Next step was to negotiate for the purchase of Inland Utilities, which was serving the more densely populated and more profitable urban communities. Negotiations were completed and the final purchase recorded seven months later, in May, 1949. The newly formed co-op took over all of Inland Utilities holdings in the region, including generating equipment and distribution facilities. The area served now includes 2842 square miles, spread out over the west half of Scott County, all of Wichita and Greeley Counties and portions of Wallace, Logan, Hamilton and Kearny Counties. In addition, the co-op serves part of Kiowa County in Colorado. More than 1275 miles of distribution line are now energized by the Wheatland Electric Cooperative.

When the Wheatland Co-Op's new power plant, located within Scott City, was completed in August, 1951, it was christened the Jess Taylor Plant, in honor of the president of the Board of Directors which had consummated the reorganization. Installed were four model 31AD18, 10-cylinder, 18-in. x 27-in. Fairbanks-Morse dual-fuel engines, each rated 3500-hp at 277 rpm. These engines are direct-connected to 3125-kva., 2345-kw (de-rated at Scott City's 2970-ft elevation), 3-phase, 60-cycle, 2400/4160-volt alternators, which are connected through silent chain drives to 30-kw exciters. With the opening of the new plant, the co-op was in a position to retire to standby duty three power plants included in the purchase. These plants are located at Scott City, Leoti, and Syracuse, Kansas. They are run an average of six hours per month, principally to maintain this equipment in good operating condition.

Since 1951, the load at the new plant has more than doubled, jumping from 3600 kw to 8000 kw in 1955. The biggest increase came during the first year of operation, when peaks jumped from 3600 kw to 6000. At an average increase of 500 kw per year, it is expected that peak loads will reach 11,000 kw in 1960 and 13,000 kw in 1965. These are highly tenuous predictions, based on a 1952 study by the Rural Electrification Administration. It is the experience of most REA Co-Ops that load outruns the most optimistic predictions. Annual production volumes have shown a similar trend upwards. In 1952, the first full year of operation, the plant produced a total of 22,742,000 kw hrs. In 1953 this increased to 26,852,000 kw hrs, in 1954 to 30,145,000 and in 1955 to 31,571,000 kw hrs. The 1955 figure represents an increase of more than 37 per cent over the first year of operation, and 4.5 per cent above the previous year.

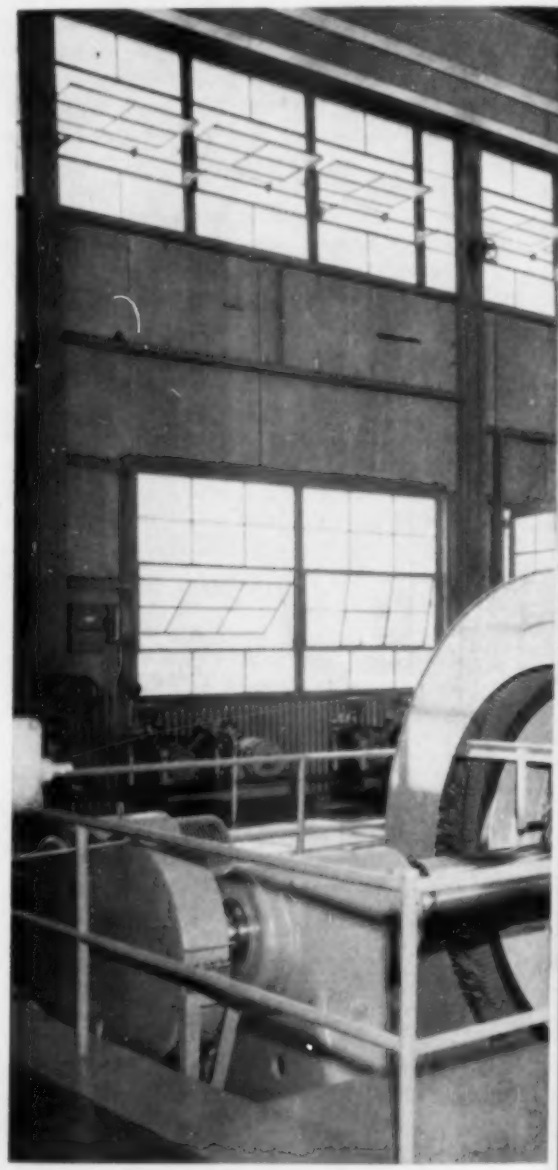
In part, the efficiency achieved to date, reflected in the plantwide average of 9,944 Btu per kw hr, can be traced to the comprehensive preventive maintenance program instituted by the plant superintendent, Wesley Retherford. There has been a constant effort at this plant to reduce the percentage of pilot fuel burned in the dual-fuel engines. The No. 4 engine has been the focus of attention in this program and results have been noteworthy. For the year 1955, with a load average under three-quarters, the engine averaged 4 per cent pilot fuel. At full load, the unit purrs along on a lean 2.5 per cent pilot oil. Mr. Retherford reports further that any one of these dual-fuel engines will carry a full load in hot weather. While this reporter was at the plant, Mr. Retherford placed a load of 2500 kw on the number four engine. Over the next 15 minutes, the engine burned 2.5 per cent pilot oil. No abnormalities were detected, and the temperature outside of the plant during the test was 108°F. in the shade.

A high-detergent type lube oil is used in both the crankcase and cylinder lubricators. Stored in two 5,000-gal. underground tanks, makeup oil is transferred to each unit by a 1¼-in. motor-driven pump, passing through a strainer and recording meter. The cylinder lubricators draw oil from the crankcase. For starting and shutting down operations, a 6-in. before-and-after lube oil pump is installed for each engine. This pump can also be used as a main circulating pump in the event of an emergency, thus providing valuable standby protection. The lube oil is cooled in individual shell-and-tube type heat exchangers, equipped with automatic by-pass valves to permit close control of lube temperatures. To date the lube oil has never been changed in any of the four engines. Filtration is provided by a full-flow strainer on the pressure side of the built-in circulating pump and by individual by-pass type, waste-packed filters for each engine. The oil company analyzes the oil each month, and the plant conducts its own tests. The lube has always been in excellent condition.

Each engine is provided with a closed jacket water cooling system. Makeup is drawn from the plant's own well and is softened in a zeolite softener. In addition, it is treated with a chromate rust inhibitor before being added to each surge tank. The jacket water is circulated through each engine and through individual shell-and-tube type coolers by a 6-in. centrifugal pump, driven by a 15-hp, 1455-rpm motor. Two such pumps are installed for each engine, providing standby protection. Jacket water temperature is maintained within maximum efficiency range by means of automatic, thermostatically-controlled by-pass valves. There is a common raw water system for all four engines, built around an induced-draft cooling tower. Two 12-in. vertical propeller pumps, driven by 60-hp motors and one 8-in. vertical propeller pump, driven by a 30-hp motor, circulate cooling water from the tower sump through the jacket-water and lube oil heat exchangers and back to tower sprays. A parallel system with a 1½-in. motor-driven pump, circulates raw water through each engine's intercooler.

The scavenging air system for the number four engine differs slightly from those serving the other three Fairbanks-Morse engines. Whereas three engines are equipped with engine-driven blowers, the number four engine is provided with a 24-in. centrifugal blower, driven by a 300-hp, 3550 rpm motor. This blower has a discharge pressure of 3.0 lbs. and an inlet volume of 17,700 cfm. On all four units, scavenging air is drawn through self-cleaning type filters, passing through the blowers, then through water-cooled intercoolers, and then to the cylinders. Starting air is supplied by a 6¼-in. x 3¼-in. x 4-in. two-stage compressor, V-belted to a 15 hp motor. A similar unit, driven by a 3¼-in. x 3¼-in. gasoline engine, is installed as a standby. Exhaust gases are expelled through vertical silencers, erected against a side wall.

At the blower end of each engine is mounted a standing type, full-vision gauge panel, equipped with duplex gauges on fuel oil (before and after the filter), and on lube oil (before and after filter).

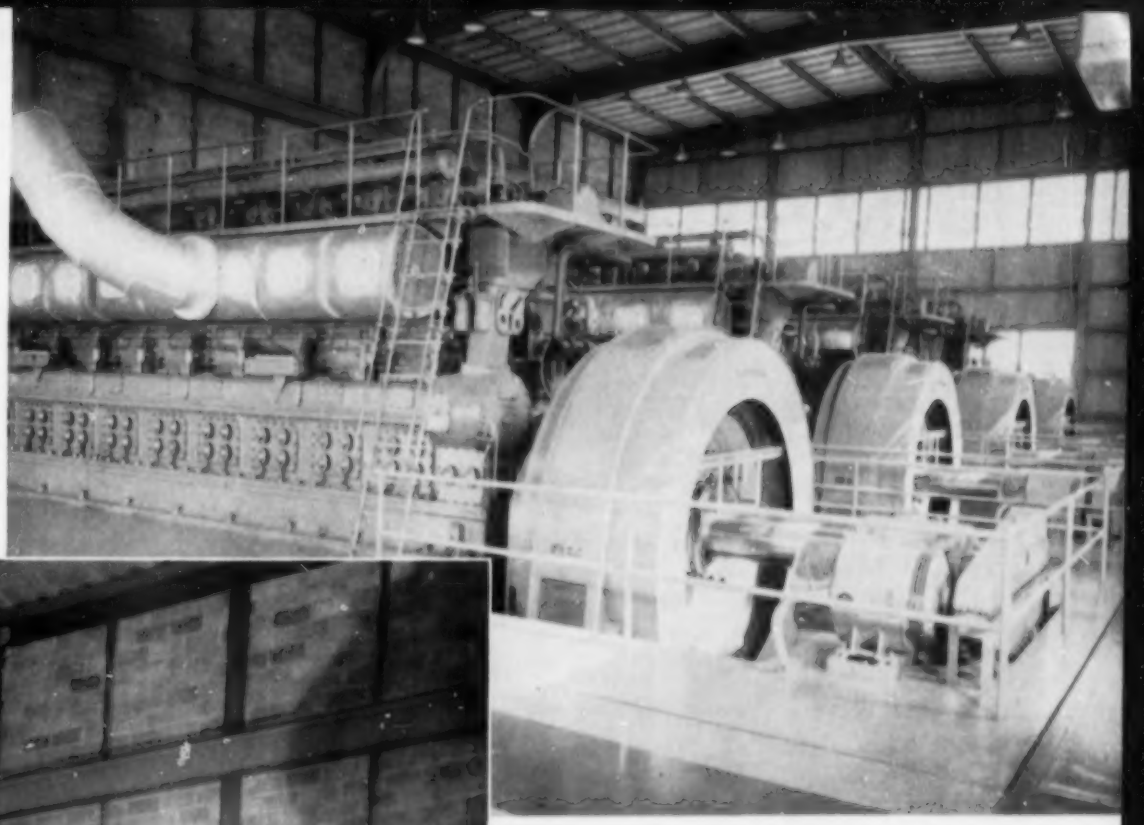


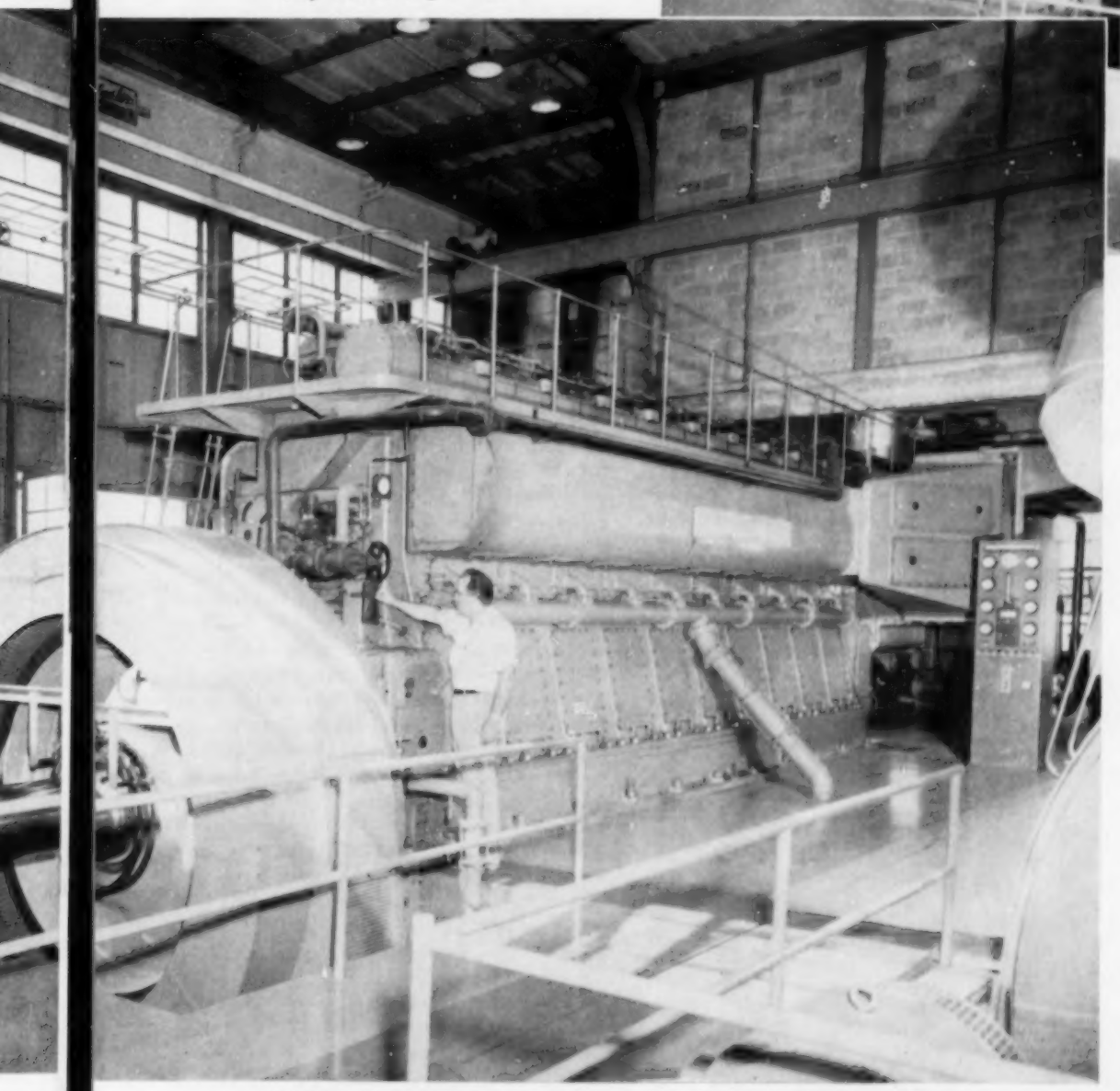
This board also contains gauges on jacket water pressure and temperature, lube oil pressure and temperature, gas pressure, raw water pressure, and mercury gauges on scavenging air pressure and starting air pressure. In addition there is a multi-point exhaust pyrometer and visual and audible alarms on all above pressures, except fuel oil and starting air pressure. Also installed for each engine is a 24-hour recorder, providing a permanent graph of gas pressure, volume and temperature.

All power at the Jess Taylor plant goes out at 13,200 volts, with the exception of two 69,000-volt

lines which go to Dighton and Syracuse, Kansas. Power is stepped up from 4160 volts by separate 3000-kva. tranformers installed for each engine. Two 5000-kva. transformers are installed for the 69,000-volt lines. Power is controlled at the plant at a 15-panel switchboard, constructed as a single unit. There are four engine panels, 11 distribution panels and a swinging synchroscope. The plant

Responsible for the sharp reduction in operating costs at the Wheatland Electric Co-Op plant are these four Model 31AD18 Fairbanks-Morse dual-fuel engines, each rated at 3500-hp at 277 rpm. They drive 2345-kw F-M alternators which are de-rated at Scott City's elevation of 2970 feet. Also shown are the 30-kw F-M exciters, Link-Belt silent chain drives, Nugent duplex fuel oil filters, Madison-Kipp cylinder lubricators and 5-hp F-M barring motors.





Wesley Retherford, plant superintendent at the Wheatland Co-Op plant, adjusts the Woodward governor on the No. 1 Fairbanks-Morse dual-fuel engine. Also shown are the Asco automatic shut-down control and the F-M gauge board.

normally has a complement of 11 men, including the plant superintendent and two maintenance men. All lube oil, fuel oil, jacket water, raw water, starting air and gas lines are painted distinctive colors as a safety measure.

In every respect, the Jess Taylor Plant at Scott City is an up to date, attractive power station, operating at excellent efficiency and economy. Wheatland Co-Op's success in overcoming a seemingly hopeless rural electrification problem is outstanding and is an excellent reason why American farmers today are enjoying the full benefit of power-driven tools, pumps and appliances. Much of the success achieved lies with the plant personnel, with Mr. Retherford and with the equipment installed. Full credit must go to Mr. Taylor, to the other members of his board, to Dr. H. Preston Palmer, the current president of the co-op and to W. A. Dobson, who is general manager.

List of Equipment

Engines	(4)	Fairbanks, Morse Model 31AD18, 10-cylinder, 18 x 27, dual-fuel engines, rated 3500-hp at 277-rpm
Alternators	(4)	Fairbanks, Morse Type TGZO, 3125-kva., 2345-kw, (at 2970 ft elev.), 3-phase, 60-cycle, 2400/4160 volt alternators
Exciters	(4)	Fairbanks, Morse Type DG, 30-kw, 240-amp., 1450-rpm
Silent chain drive	(4)	Link Belt
Governors	(4)	Woodward
Gas regulators		Fisher Governor
24-hour gas meters		Roots-Connersville
Fuel oil meters		Bowser
Fuel oil duplex filters		Nugent
Lube oil		City Service
Lube oil transfer pumps		Viking
Lube oil full-flo filters		Nugent
Cylinder lubricators		Madison-Kipp
Lube oil b and a pumps		Roper
Lube oil coolers		Ross
Thermostatic valves (lube)		Powers
Jacket water heat exchangers		Ross
Air compressors		Gardner-Denver
Exhaust silencers		Maxim
Gauges		Marshalltown
Exhaust pyrometers		Alnor
Air filters		Continental
Scavenging air blower (No. 4)	(1)	Roots-Connersville
Switchboard		Westinghouse

SALVAGE YARD SWITCHES TO DIESEL

By L. H. HOUCK

IT is not uncommon for a diesel to replace a gasoline engine and occupy the same space, but when one diesel engine replaces two gasoline engines and occupies only half the space of the largest unit it becomes news of primary industrial importance. When the one diesel engine, occupying half the space of one of the gas engines, performs the same work of the two engines on 15 gallons of No. 1 high-speed diesel fuel which required 25 to 30 gallons of gasoline for the same 9-hour period, it makes the combination that brings the engineers scurrying to see what the hookup is and where these important gains have been made.

Federow Iron & Metal Co., Springfield, Mo., has been one of the largest junk dealers in the Middle West for half a century, handling vast quantities of iron, steel and non-ferrous metals and conducting big salvage operations. Prior to 1949 most of the ferrous metals were handled by small cranes, usually truck-mounted and by hand. It bought an Insley crane with a 40 ft boom, equipped with dc generator and 39 in. magnet from Chiles Tractor & Machinery Co., Springfield, Insley and Allis-Chalmers dealers, in 1949. It was equipped with a 40 hp gasoline engine direct-connected to the hoist and swing and crawler track machinery and a 12 hp gasoline engine which drove a 7½ kw, 250-volt dc generator powering the 39-in. Ohio magnet.

Howard Taylor, yard superintendent and in charge of maintenance, consulted experts with the idea of having one engine do all the work, particularly since he virtually wore out a generator engine in this hard service in 17 months. But he was told that the one gasoline engine could not pull both the crane machinery and the generator since the extra load would cause a drop in rpm which would decrease the current to the magnet causing excess droppage of scrap, or less pickup tonnage per 100 swings. With this information and a green light from the owners, Ben Federow, president, and Harry Federow, vice-president, he went to Chiles where they developed the idea of replacing the two gasoline engines with one 3-cylinder two-cycle diesel (3-71 GM), since the lugging characteristics of the diesel seemed to be the answer to the problem. The engine was installed and the generator was driven with a pair of V-belts from the fan end of the crankshaft while the other end of the crankshaft was direct-connected to the crane's hoist, swing and track gear through the conventional dragline controls.

First trials proved that there was no appreciable rpm drop when the hoist and the generator were both being operated. In fact, so right were their prognostications, there weren't even any bugs in the rig setup. No loads were dropped from the magnet as was predicted. If a little original field engineering is good then a lot ought to be better. In 1950 they bought a new Model K Insley and installed the same system, another in 1954 and the latest one, to make a total of three Insley cranes with 40-ft booms, in 1955. On the newer cranes the cabs were so constructed that the V-belts could be eliminated and Superintendent Taylor installed the generator on the front ends of the GM diesels by connecting them direct to the crankshaft through a universal coupling. "There is much less maintenance with the diesel," Howard Taylor, yard superintendent, told DIESEL PROGRESS, "and they are cheaper to operate. We get more horsepower in half the space that we did with the gas jobs. We've clocked 13,000 hours on one of our GM engines with the only repair being a water pump."

Sometimes field improvements do not meet with the approval of operators but in this case all three operators are enthusiastic about the arrangement and have no complaints about the operation of the magnets. Handling heavy loads of metal by magnet is a tricky job for an operator who has to be sure that he can hold his loads. Erratic performance and unexpected dropping can be dangerous as well as economically wasteful in power and man-hours. The magnet is operated by the operator

Oldest Insley crane was placed in service in 1950 and uses belt drive from front of 3-cylinder, 2-cycle 71 Series GM engine. Width of cab does not permit direct connection installation and generator is in front of cab and engine in rear. Nested in a pile of old iron, it's a tough place to work for man and machine.

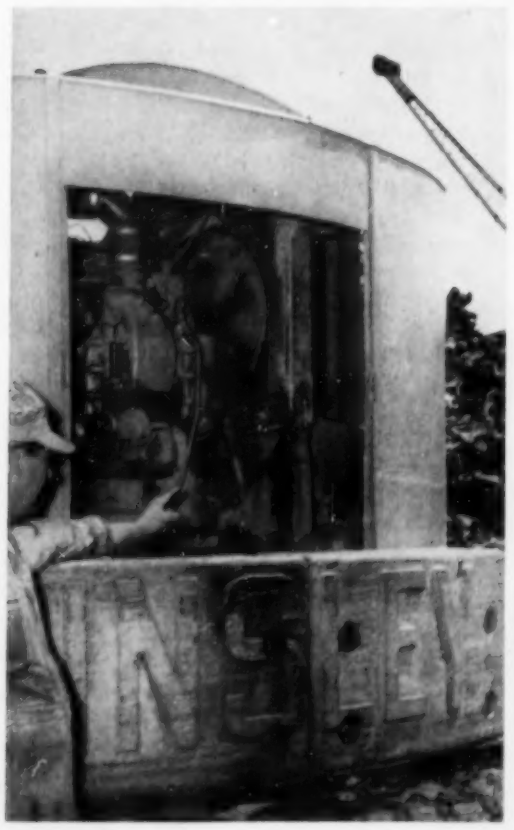
from the cab. A push button energizes the magnet when he drops it on a pile of ferrous metal and both the generator and the crane motive power are under load when he raises the plate. When he dumps he presses the button again to demagnetize so that the residual magnetism in the plate will not retard the quick drop in releasing the load. Any rpm drop in the engine would have dropped loads, but the diesel doesn't slow down. With its high torque the diesel stays right up to speed. This caused power cost to be materially reduced. Howard Taylor said that this was an important factor contributing to the fact that the two gasoline engines consumed from 25 to 30 gallons of gasoline in a 9-hour shift and that the diesel uses only 15 gallons of No. 1 high-speed diesel fuel in the same period. He uses the best in fuel and lubricating oil.

The three Insley cranes, equipped with 3-71 GM engines, each handle 39 in. magnets, one is an Ohio and the other two are EC & M's. A truck is equipped with a 25 in. magnet and used for short intervals and spot moving. Its gasoline engine is also to be replaced by a diesel and its task increased from about four hours daily to a full shift or more. But the change to diesel does not stop there. They ship out all their ferrous metals to St. Louis in railroad cars over the Frisco, an all-diesel line but the non-ferrous metals are trucked to St. Louis by tractor-trailer combination with capacity loads. This truck is now a diesel unit—an International R-200 with a Cummins Turbodiesel, JT-6-B, and its performance is almost as spectacular by comparison. The International makes the round trip from Springfield to St. Louis and back in three hours less time than their other unit and does it on 30 gallons less fuel.

Non-ferrous metals are hauled to St. Louis in a tractor-trailer with capacity loads. This R-200 International with Cummins Jt-6-B Turbo-diesel engine cut three hours off the previous round trip time with gasoline engine powered trucks and saved 30 gallons of fuel.

Operators must watch their loads constantly and they like the new hookups with one diesel engine driving both crane machinery and electric generator which supplies current for the magnet.

Howard Taylor, yard superintendent for Federow Iron & Metal Co., points to the generator at the far right direct-connected to the 3-71 GM two-cycle diesel engine which replaced two gasoline engines in each of three Insley cranes.



GAS TURBINE PROGRESS

A COMMENTARY BY R. TOM SAWYER

R. Tom Sawyer's well known in the gas turbine field having been the first chairman (1944) (and now treasurer) of the Gas Turbine Power Division of ASME. He spent 7 years with G.E. Transportation Dept., and 26 years with American Locomotive, now Alco Products. At present he is a Consultant, including "Consultant to the Staff" of the Experimental Towing Tank at Stevens Institute of Technology. In addition to being a Fellow Member of ASME and AIEE, he is a member of SAE, ARS, ANS, IME in London, DEUA in London. He is also a member of Franklin Institute and a Professional Engineer. Mr. Sawyer is the author of *The Modern Gas Turbine* and *Gas Turbine Construction*, and co-author of *Applied Atomic Power*.

YOU are now reading the first column published in DIESEL PROGRESS exclusively devoted to the gas turbine. The object of this column is to show where the gas turbine has a future and to relate each month certain features, details and/or examples pertaining to the gas turbine. Unquestionably many of you who are reading this column know what a gas turbine is, have had actual experience with gas turbines and know certain details far better than I do. There are others who have spent their life with diesels, who know diesels, yet are anxious to learn more about gas turbines. This column is also written for those who feel the diesel can live not only for many years but also can be improved in many ways.

Today let us review the history of the gas turbine and the accomplishments of some of the men responsible for it. England was the first country to issue a patent on the gas turbine. This was in 1791 and the inventor, Mr. John Barber, had a crude but rather detailed design using producer gas for fuel. Switzerland is fundamentally the first home of today's gas turbines, other than those used for aviation. In this small beautiful country there are many who have spent their entire lives carefully working to perfect the design of the various types of gas turbines. Let me tell you about three men in Switzerland whom I have known for many years.

Dr. Adolph Meyer is recognized throughout the world as the one man who not only perfected the stationary gas turbine but together with his skilled engineering department, and of course the complete cooperation of the Brown Boveri Company, was the first to put the large gas turbine into production. In fact, for several years now Brown Boveri gas turbine production has been equal to or even greater than their steam turbine business. In the summer of 1955 I had the pleasure of having dinner with him in his home along the lake at Zurich. His favorite sport is sailing and when you see the trim lines of the boat he handles and the way he handles it you realize from a scientist's point of view he is not only a master of hydraulics, but also he has a love for aerodynamics, which he carefully built into his gas turbine designs. In time this column will tell more about his first central station built at Neuchatel and tested in 1939 at the Baden shops under the personal supervision of Professor A. Stodola. The first gas turbine locomotive was placed in service in 1941 on the Swiss Federal Railways and again Dr. Meyer was responsible. His many accomplishments have been publicized in all the principal countries of the world. For the past 20 years or more, Mr. Paul R. Sidler, President of Brown Boveri Corp., of New York, has presented many papers on the subject.

The second man I wish to speak of in Switzerland is Dr. Alfred J. Buchi who first made extensive tests in turbocharging a 4 cycle engine in 1911 (up to 28 lbs/sq in. gauge pressure). So that you may comprehend the unusual foresight this man had, let me quote you from my book *The Modern Gas Turbine*. "In 1929 Dr. Buchi suggested (in a book published honoring Professor A. Stodola) the following three turbocharger engine arrangements and made calculations to demonstrate their feasibility. All these arrangements are engine compounding. Case 1. Both the engine and the turbine furnish useful power, where useful power may be taken from both the engine and turbine shafts, or where the excess power of the turbine is delivered to the engineshaft through a gear train or suitable method. Case 2. The engine alone furnishes useful power, the turbine just driving the supercharger. This system, using suitable multiple exhaust pipes between the engine and the turbine, is now recognized as the Buchi Turbocharging system. Case 3. The exhaust turbine alone delivers useful power, the engine just driving the supercharger blower and its auxiliaries. Please note that the Gotaverken System (as well as others including the free piston engine), operates also on this fundamental principle."

For many years Dr. Buchi and Dr. Meyer worked together very closely. Dr. Meyer was mainly responsible for the manufacture of turbochargers through Brown Boveri and Dr. Buchi operated the Buchi Syndicate engineering firm. When I was in Winterthur in August 1955, Dr. Buchi showed me some of his new developments including a well tested unique design of turbocharger. When I got back home one of my friends said "How is the old man?" My reply was, "He will never be an old man; his long range future plans for the turbocharged diesel, his energy, his ambitions and his activities are even more than when I first met him 25 years ago in the same town of Winterthur, Switzerland."

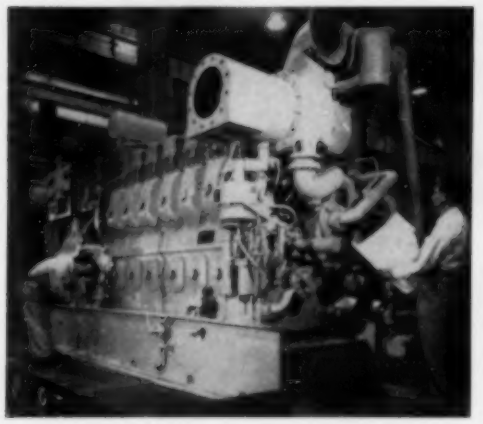
My third man from Switzerland is Dr. Curt Keller. As Director of Research and Development for Escher Wyss Engineering Works at Zurich he had charge of building the first closed cycle gas turbine power plant completed in 1939. This was designed jointly by Prof. J. Ackeret and Dr. Keller and known as the AK plant. This type of plant has not been widely used to date even though it has some unusual economical applications. For this one application alone we shall in the years to come refer to Dr. Curt Keller as the father of that gas turbine design most suited to be used with an atomic reactor for the purpose of producing power. The Escher Wyss Engineering Works has not been working alone in this great field of atomic energy but has a one-half interest in the American Turbine Company along with Sanderson & Porter of New York. Mr. Philip B. Taylor is president of the American Turbine Company, and its engineering leader is Vice President S. T. Robinson, a close worker with Dr. Keller.

You have heard what a tremendous international success the Geneva Conference of Atomic energy was in August 1955. At that conference there were several hundred exhibits including practically all types of atomic reactor power plants. There was only one exhibit describing gas turbine atomic power, and that by Escher-Wyss. Dr. Keller was there, and for old times sake he put his arm over my shoulder and said, "We have had an unusual amount of interest in this exhibit; people are now finally realizing the advantages of the closed cycle gas turbine for atomic power, especially that its high efficiency is just as necessary with atomic fuel as any other, and this plant will handle any fuel."

As the reader watches this column from month to month he will find it will cover all types of gas turbine design—not only prime movers, but turbochargers of a few hp for diesels up to 20,000 hp, and more for supercharging central station boiler plants, steel mills, etc.

The 2nd Annual Gas Turbine Conference and Exhibits will be held in Detroit, March 18th to 21st, 1957. For details contact Mr. Barry Freer, Chairman, Exhibit Committee, 1300 Connecticut Avenue, N. W., Washington 6, D. C., or Mr. J. M. Clark, ASME Headquarters, 29 W. 39th Street, New York 18, N.Y.

Diesel Electric Package Unit



Alco Products, Inc. has delivered its first alternating-current diesel-electric power package, a skid-mounted unit for a new incinerator plant for the town of Oyster Bay, Long Island. The package is powered by the new Alco 251-B, 6-cylinder diesel, a light-weight, heavy-duty turbocharged engine designed for both stationary and portable applications. For this installation, the engine is rated at 690 hp at 900 rpm. The power unit was built for George Allen & Sons of New York City, general contractor for the Oyster Bay incinerator plant. The engine-generator set requires only a 20 in. concrete foundation. The Alco package permits a light foundation because its weight is distributed over a large bearing surface, making the unit load under 1,000 lbs/sq ft. There is no torque applied to the foundation by the package design.

Besides the 251-B engine, the package consists of a 485-kw ac generator with top-mounted, belt-driven excitation. The unit has self-contained lube oil, fuel oil and shell and tube jacket water cooling systems. The Alco-built unit will be used as the main source of power at the start of each operating week at the incinerator installation, until steam pressure and operating temperatures are attained for a turbine-generator unit. The Alco package also will be available in emergency as a prime power source. The 251-B, 6-cylinder ALCO engine is built at the company's Auburn, N.Y. plant. It is a 4-cycle engine with a 9-inch bore and 10½-inch stroke. The engine base and frame are structural steel, which affords the advantage of light weight with no reduction in strength. The engine weighs 21,350 lbs dry and 22,500 lbs wet. The model 251-B engine-generator set is available for a wide variety of stationary power applications.

Diesel Gradall

Shown removing rock and earth from an embankment along U. S. Highway 22 near Monroeville, Pa. is this Gradall excavator powered by a three-cylinder Detroit diesel engine. Frank Donatelli and Co., Inc. of Pittsburgh is contractor on the job which calls for widening a seven-mile section of the highway between the Pennsylvania Turnpike and Pittsburgh from 33 ft to widths up to 60 ft.

Two New Shrimpers

Recently launched and already fishing out of the West Coast of Florida are the two trawlers *Miss Bobbie* and *Tempest*. They were designed by Tams, Inc. and built by Diesel Engines Sales Co. of St. Augustine, Florida. The 67 x 18 ft craft are of wood construction which is so popular with Florida fisherman and both were package deals. Both are powered with D342 Caterpillar diesels and 3:1 Twin Disc r&r gears and 48 x 36 in. four blade Columbian propellers. The *Miss Bobbie* is owned by the Wilson Shrimp Co., Hookers Point, Tampa while the *Tempest* is owned by Rodney Pacetti of Fort Myers, Fla.

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AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

Engine Bearings—From Lead to Aluminum

CRANKSHAFT bearings have been the subject of a tremendous amount of evolution since the days of poured babbitt. From a bearing material composed principally of our heaviest common metal—lead—the trend now seems to point to one of the lightest—aluminum—as the main constituent. The principal reason for the many changes which have taken place has been the increasing severity of duty and conditions which the development of all types of internal combustion engines have imposed upon main and connecting rod bearings. Higher speeds, higher bmep, higher duty and higher crankcase temperatures have all made severe exactions on the crankshaft bearings. In addition, in the automotive field, the necessity for lighter weight has intensified all of these trends, while requiring lighter and more compact engines as well.

Bearing unit pressures are higher than a few years ago and will unquestionably go higher still if the bearing manufacturers can provide bearings which will accommodate them. With both rpm and journal size on the increase, the rubbing velocities between the bearings and their journals are going up and limits of tolerance on journal size, roundness and straightness have had to keep pace with the greater dimensional precision of the bearings themselves and the closer clearances demanded. Today, practically all automotive diesels have case-hardened crankshafts, the electrical induction method being the universal method of securing a glass-hard skin hardness over a relatively softer and therefore tougher core. Most American automotive diesels have their crankshafts counterweighted to secure dynamic balance and not a few of them use some form of torsional vibration damping. These things have assisted in providing a more favorable climate in which the bearings must work, but have not been sufficient in themselves to completely solve the problem.

Not only lubricating oils, but the methods of lubrication are steadily becoming more complex. So far as the oils themselves are concerned, the use of additives of various kinds has become a must, including anti-oxidants, dispersal agents or detergents, etc. Base stocks are carefully selected and blended, specially processed to reduce harmful elements and contaminants. Pressure feed of oil to main and connecting rod bearings, of course, is universal, with practice divided as to pressure feed to wristpins by drilled rods or by squirt ports on the sides of the rods. Two-stroke engines, of course, must have copious flow of oil through the rods to provide jet cooling of the piston undersides. Much work has been done in bearing lubrication to decrease the amount of grooving necessary in the bearings, while still maintaining continuous feed to the rods. More attention is constantly being directed toward control of crankcase temperature, since the viscosity of the oil and its susceptibility to oxidation and acid formation, to varnishing and sludging are all affected by temperature. In this development, nearly as much effort is made to avoid insufficient temperature as to ward off excess. The ideal is, as it should be, the maintenance of as nearly constant oil temperature as possible, while the engine is in operation. So we find the engine designer making constantly more severe demands upon the oil refiner on the one hand and the bearing producer on the other, while continually ameliorating the conditions under which both bearings and oil must work.

From the ancestral poured babbitt, progress in engine bearings has proceeded along two lines: structural and material. First came the bronze-backed babbitt bearing and then the steel-backed type. Next the thick steel-backed type yielded to the thin-shell type of today. From the hand-scraped and burned-in finish of the early days, progress has proceeded along several lines. In turn, line-reaming, single-point boring, first with steel and then with diamond or tungsten-carbide cutters and finally precision bearings have marked the way. From solid, filed shims to laminated shims and finally to no shims at all, the march of progress has been. In materials the development has not been less spectacular. Babbitts of various analyses were developed to produce the utmost desirable properties of which the babbitts are capable. This was followed by various other alloys, such as cadmium-nickel and cadmium-silver and then by copper-lead mixtures. During the war, bearing alloys with a high percentage of silver were tried for military application with considerable success; but these never received serious consideration for civilian use because of their high cost and the limited availability of silver. Since that time aluminum, as a bearing material, has come to the fore. Bearing metals must possess a combination of characteristics in varying proportions, according to the conditions to be imposed upon them. An ideal bearing would be high in conformability, that is, sufficiently ductile to adapt itself to the shape of the journal. It must have a low friction coefficient in contact with the journal. It must also have a reasonable amount of embedability, that is, ability to absorb abrasive particles and must be free of abrading tendency on its own part. It must have adequate strength to withstand the pressures and impact to which it is subjected and resistance to fatigue. It must resist the corrosive effects of water and the acids which form in the crankcase. These qualities are required in the bearing as a unit, and not necessarily in the lining material alone. Thus, a thick bearing will require higher mechanical properties than a thin one. A thin one requires greater wear resistance. The degree of heat resistance required will depend upon the provisions in the engine design for oil cooling and rapid conduction of heat away from the bearing. The oil itself is an important cooling medium, so the volume of oil flow will have an effect upon bearing temperatures. Even such things as full-length water-jackets and hollow crankshaft journals have an effect upon journal and bearing temperatures.

One reason for the universal use of thin-shell steel-backed precision bearings in modern automotive engines is that they provide much firmer backing for the bearing, reducing the stress on the bearing metal itself and more rapid heat conduction through their thinner substance. Quite popular in the automotive diesel field is the copper-lead thin-shell precision type bearing, in which the lead is mechanically mixed, rather than alloyed with the copper, so that the latter provides a cellular matrix to support isolated particles of lead. This material shows high resistance to both wear and fatigue, is strong and a good conductor of heat, but is subject to corrosion when used with

improper oils. It is fortified, in some cases, with a micro-thin layer of tin-lead alloy, acting as a metallic lubricant and a shield against acid attack.

Modern crankshaft bearings are cast or sintered as a thin lamination over steel backs, formed from strip metal. Overlays, when used, are usually plated on. They are finished to high precision and must be provided with boxes equally precise in dimension and surface. Their split boxes are drawn together without shims, the edges of the bearing halves being slightly high, so that as the caps are drawn up there is a definite crush, thus seating the bearings very tightly in their boxes. This is essential to insure even bearing on the journals and good heat transfer.

Latest step in engine bearing development is the aluminum bearing. Exhaustive research and development work has resulted in extremely favorable results in some cases. The metal is considerably harder and more wear-resistant than babbitt and, unlike copper-lead is highly resistant to corrosion. It is inferior in strength to the latter, however, and particularly in fatigue resistance. It is not so readily conformable as the other materials, but it has excellent heat conduction. These limitations are being met by designing the bearings as steel-backed thin shells and by work-hardening the material in the course of manufacture. They have proven well adapted to high-speed, heavy-duty diesels with hardened crankshafts and should be considerably more economical than those made of costlier materials.

Vice-President Elected

C. K. Olson, Jr.

Mr. C. K. Olson, Jr. has been elected Vice-President and Director of Sales of all products manufactured by the Yates-American Machine Company of Beloit, Wisconsin, according to an announcement just released by Mr. J. J. Gallagher, President. For the past two years Mr. Olson has been coordinator of sales for the Head & Knife and Lipman Refrigeration Divisions as well as the J-Line, Power Tool and Heavy Woodworking Divisions. In addition to his present duties he will now direct the sales program of the Heat Transfer Products Division. His added responsibility includes sales direction of a new line of heat exchangers recently introduced by Yates-American. Prior to joining the Beloit concern in early 1954, Mr. Olson was general manager of a plant manufacturing industrial locomotives and director of sales of a diesel engine plant.

EMD Officials Visit George Engine Co.

A group of officials of the Electro Motive Division of General Motors Corporation recently visited George Engine Co., Inc. of Harvey, La. George Engine Co. is General Motors' petroleum industry dealer for diesel electric oil field drilling equipment. During their visit, the officials were conducted on a tour of the Harvey, La. plant, which is closely allied with General Motors in several lines. George Engine holds the exclusive franchise for GM marine, industrial, and oilfield engines in this territory and is one of the world's largest marine diesel engine distributors.

The Electro Motive Division of General Motors pioneered in the manufacture of diesel electric equipment for railroads. The Division is now producing diesel electric drilling equipment. Pictured in front of the George Engine plant in Harvey are (l. to r.) B. E. McMichael, Service Manager for George Engine; Fred Batty, General Service Manager for Electro Motive Division of General Motors; R. J. Naquin, Parts Manager of George Engine; George S. Frierson, President of George Engine; Frank A. M. Williams, Vice President and Comptroller of George Engine; H. F. Colby, Sales Manager of George Engine; Frank Doonan, Sales Manager for Electro Motive, who is in charge of the newly opened Morgan City office; Don Queeney, Industrial Sales Manager of Electro Motive Division; and H. P. Gustavson, Manager of Petroleum Industry Sales for Electro Motive Division.

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CLUTCHES

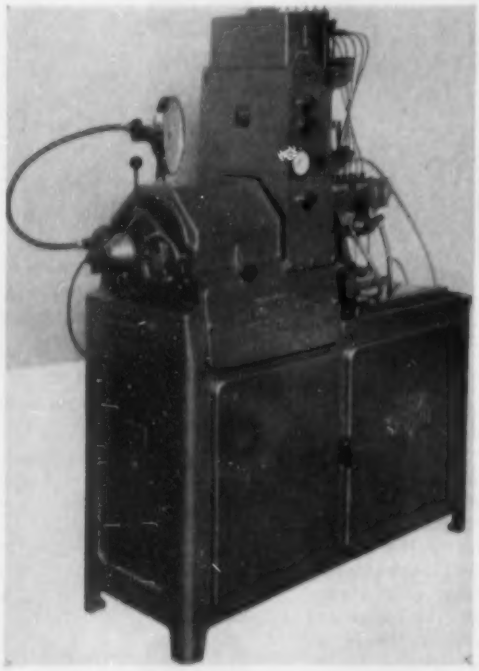
WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **BERNARD W. LANSDOWNE**

Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C., Ltd., Southall, following which he served some five years with that company's sales engineering department. He entered technical journalism as assistant editor of "Gas & Oil Power" in 1950 and was appointed editor in 1952.

Checking Fuel Pumps Electronically

Machines made by Leslie Hartridge, Ltd., of Buckingham, England, for servicing fuel injection equipment are now in use in many parts of the world, and the Hartridge range covers everything from special vices for holding fuel pumps to nozzle re-conditioning equipment and fuel pump test benches. A new development on the latter is now available in the form of electronic phasing which is a patented method of insuring accurate and speedy pump adjustment.



The device enables an operator of a fuel pump test bench to see, merely by pressing a switch, a complete picture at eye level of the exact position of the commencement of injection on each of the plungers of the pump on test. Phasing of the pump is entirely automatic once it has been set up on the machine in the normal way for calibration and it is quite unnecessary to make any further connections or to touch the pump again, except for adjustment. The test, moreover, is carried out under conditions identical to those encountered in actual service. A further important feature of the process is that the timing is established from the vital position, namely, at the commencement of actual injection into the cylinder, which eliminates errors that can occur between the pump and the essential injection position required to give economical and optimum performance.

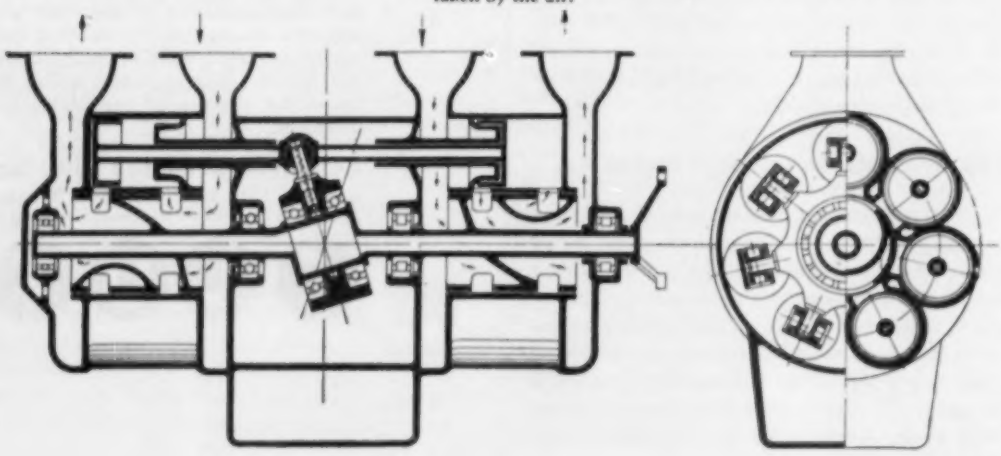
The electronic phase angle device functions as follows. Each of the master injectors has, assembled under the nozzle, a small valve which is held against the orifice by a very light spring and thus, immediately the injector commences to operate the spray forces this valve downwards which closes an electric circuit and operates a neon tube. The illumination of the neon tube quickly indicates, by a revolving pointer, the exact position of injection on a circular graduated degree ring. It is estimated that around 30 minutes per pump can be saved by the use of the new device for servicing and there is an added advantage in that the pump phasing on the new machine can be observed simultaneously by a number of persons.

A Positive Displacement Blower

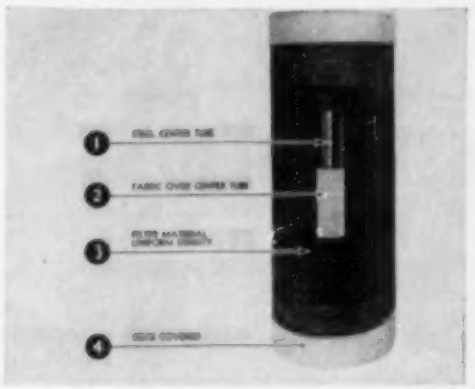
In recent weeks, I was invited to inspect a new type of mechanically-driven pressure charger now in production at Lymington, Hants., by Wellworthy, Ltd. It is intended primarily for road transport and railcar sizes of diesel engines and has been developed from an earlier design of Sir Harry Ricardo. The compressor is of the positive displacement type, there being two banks of double-acting pistons actuated by a single non-rotating wobble plate, which is mounted on ball bearings to form, in effect, a short Z crank. Each bank consists of seven cylinders grouped axially around a single central rotary valve which controls, in turn, both inlet and delivery to and from both ends of each cylinder. The pistons are reciprocated by piston rods working in long guides, which centralize them, and do not come in contact with the cylinder walls, but are given a small clearance and sealed by labyrinth grooves, thus eliminating the necessity for piston rings. Both cylinders and pistons are made in light alloy without any liners. Although it contains more working parts than a rotary lobe or eccentric vane compressor, all the parts are circular and many of them are identical.

The overall dimensions of the unit are 20¾ in. long, by 11¾ in. high by 10½ in. wide and its weight is approximately 80 lbs. The working speed of the compressor normally varies between one-and-a-half to twice maximum engine speed and at 3,500 rpm the blower has a swept volume of 402 cu ft (3¼ litres). The torque input to the blower is virtually uniform because the only rotating parts are the shaft and the valves which have a very small moment of inertia and, as a result, all that is needed to drive the blower is a belt from the engine crankshaft. This eliminates the necessity for step-up gearing or slipping clutches and simplifies the adaption of the blower to existing engines. Vee belts of steel cored construction are suitable drives on vertical engines, but on underfloor engines where water from the road creates a problem, flat belts have been found to give the best results. On new engine designs a gear drive is recommended.

Diagrammatic Arrangement of the Wellworthy pressure-charger showing the path taken by the air.



New Filter Cartridge



Tuflite, a new filter material consisting of graded cotton fibers felted into sheets and impregnated with a thermo-setting plastic resin, which is not soluble in oil or water, making these filter cartridges suitable for filtering these liquids, has been announced by the Hilliard Corp. The new filter cartridge is designed for high flow rate and low pressure drop and for removing particle sizes in these liquids down to 5 microns.

The filter elements are made in a rigid assembly to avoid sagging and shrinking, and are suitable for fine filtration of detergent and straight mineral lubricating oils, fuel and industrial oils, and many aqueous solutions such as coolant compounds.

Bulletin F-152-2 is available describing the filter cartridge more in detail, along with other literature showing the use of the cartridges within filter casings of various designs. Write to Hilliard Corp., Elmira, N. Y. for this further information.

Midget Diesel Generator Set

A unique new type of diesel generator plant has been developed by Lynn Engineering Co. The new Power-Lite Model DG-2500 packs 2500 watts of 115 volts, 60 cycle power in an amazingly small package weighing only 315 pounds, at a lower cost than some gasoline powered generators of same output. Major design goal was extreme long life with very low operating costs. It is claimed that it costs as little as ½ as much to operate and will last up to ten times as long as a gasoline powered unit of same output. Plant delivers electrical and mechanical power simultaneously through extra power take-off sheave for driving water pump or other vee belt driven equipment.

Generator operates at 1800 rpm, is glass insulated and completely moisture and fungus proofed; it has oversize sealed ball bearings and meets all U. S. Military requirements according to the manufacturer. Voltage regulation is plus or minus 5%.

Generator is rigidly mounted above engine and belt driven by steel cable, cog type no stretch vee belt; may be dismantled in a minute by removing four bolts. Engine is of original 1 cylinder horizontal water cooled German Farymann full diesel design; rated 6 hp, 4 stroke cycle, with novel flywheel condenser and built-in water tank. No water pump, fan, or radiator is required as flywheel serves all of these functions. This accounts for high efficiency of the engine. Close tolerances and ball and roller bearings throughout mean easy cold starting and long trouble free life.

Complete unit measures 20-in. wide, 25-in. long and 30-in. high. Special vibro-mounts are available for portable duty; or it may be bolted to foundation for stationary use. Voltmeter and electric starter are optional. Unit is low cost source of electrical and mechanical power for airports, radar installations, field hospitals, construction jobs, farm and industrial use; and for portable power anywhere. For additional details contact Lynn Engineering Co., Russ Bldg., San Francisco 4, Calif.

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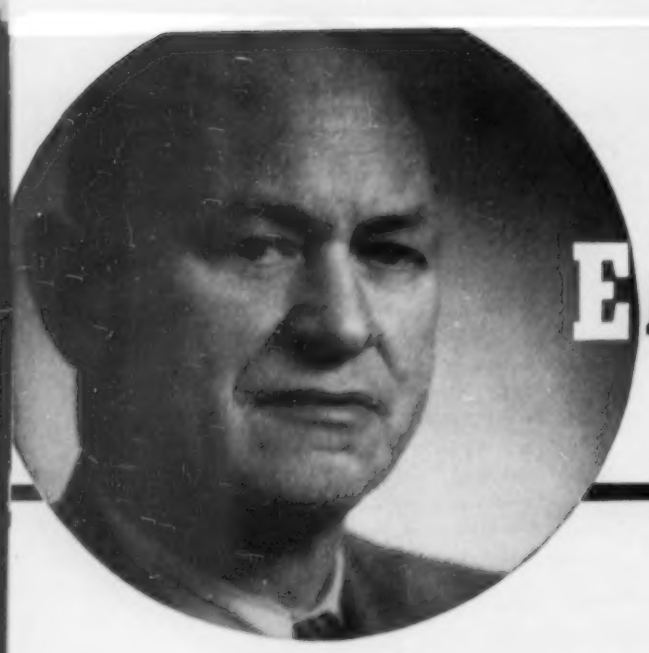

EASTERN DIESEL OBSERVATIONS

A COMMENTARY BY **ARNOLD B. NEWELL**

Arnold B. Newell, a third generation American, was born near Seattle, Washington of pioneer stock. He obtained his engineer's license at 21. Sailed as chief engineer on one of the first ocean-going motorships built in the U.S.A. In 1924 he joined New York Shipbuilding Company in diesel advisory capacity, tested and took to sea New York-Werkspoor diesels, supervised operation of shipyard owned vessels, then in 1927 joined Ingersoll-Rand as diesel field engineer. Became associated with "Motorship" in 1929. Subsequently became managing editor of "Motorship" and "Diesel Power," then vice-president and general manager.

Diesel Boats Have Higher Power

Pronounced increases in the average power of diesel boats are a matter of interest and importance to every person in the marine field. Contrary to fears that have been expressed, it is not the use of more power per boat that reduces the number of boats built. Greater power, higher efficiency and ability of one modern vessel to perform the work of two outmoded types enables boats to compete with other forms of transportation.

From the viewpoint of machinery sales and design to meet modern demands the better known yardsticks can be used to some advantage. For example, miscellaneous vessels of less than 1000 dwc each under construction to classification of the American Bureau of Shipping was 130 in July. Deliveries and new contracts signed always cause fluctuation of the figure from month to month. In this miscellaneous group, no form of power other than diesel is being installed. The average power per boat is 1380 hp. These are the big boats amongst American built motor vessels. Some are twin and others are triple-screw boats. As many as three auxiliary sets are sometimes installed in each boat, but a few hundred boats with multiple engine installations do not account for about 10,000 diesels of various sizes for use in a multiplicity of maritime services. Most of the fishing boats, many of the pleasure craft, innumerable barges with diesels aboard, vast numbers of conversions and repowerings, boats in various government services, etc., etc., combine to account for the purchase of marine diesels in large numbers. All told the marine market is good, and it will be better when we take full advantage of the nation's needs for services renderable with more boats of higher power.

All Fire Boats Should be Dieselized

While visiting with a friend in the Baltimore Fire Department, I was accorded the privilege of inspecting a steam powered fire boat 35 years old. It started out as a coal burner and was later converted to oil. To keep steam up and be ready to move, this boat burns 3000 gal. of boiler fuel weekly, some 150,000 annually and at that rate about 4,250,000 gal. of stand-by fuel has been consumed during the life of the boat, just to be always ready and yet seldom turns a wheel. At the current rate for boiler fuel, the consumption thus far for stand-by has cost about $267,750 that need not have been spent with diesels standing by and ready for even more rapid response than the steamer, in which the boilers and engines continue deteriorating without active use. There still remains a great opportunity to do a constructive fire boat selling job on the ports along the seacoast, the rivers and the lakes of this country. It is unfortunate that fine boats must be built to stand guard in comparative idleness for their entire life, but if they must stand idle and ready, the process should be as economical as diesel engines can make it.

Russian Trawlers

Undoubtedly the great tuna fleet on the Pacific Coast was first to set the world's highest standards of performance on long range fishing trips. However the Russians have taken delivery of 20 British built trawlers that are worthy of the most careful scrutiny. Having in mind Grimsby type trawlers, New England beam trawlers, the aforementioned tuna clippers and the largest purse seiners, we find lengths confined to about 135 ft and propulsion power in the 750 hp range. The Russian *Pioneer* is 189 ft long and her power is 1100 shp maximum. Accommodations for officers and crew are excellent. The most modern equipment is employed throughout. Scrap from dressing fish at sea is converted to fish meal and brought to port. Facilities are set up to can the fish liver fresh. Economy of operation is paramount. Efficiency is high. Cruising range is long. If such vessels enter the world markets for fish, competition will be strong. I am not prepared to say that the operators of fishing vessels can afford to experiment with such obviously costly ships for work as trawlers. On the other hand, can we as a nation afford not to keep pace with such an advanced pattern?

Rural Electrification in Alaska

We sourdoughs, especially from the island region of Southeastern Alaska, always looked upon hydro-electric power as cheap and everywhere available. However REA has financed quite a large number of diesel electric plants of relatively small capacity in Alaska. Diesels are used because the cost of building even the simplest kind of water power plant is prohibitive. Now the question is, why build a power plant at all? We have complete power units ready to start up and put on the line immediately upon arrival. They are self contained and in some instances the price is as little or less than the components of a stationary plant. In some areas of Alaska ships can make only one trip per year to deliver heavy machinery and this makes transportation costs quite high. On the other hand a power plant can be transported by plane in a day or two from manufacturer to point of use.

In this connection our British friends Napier & Son Ltd. of London have set a nice example with a Deltic diesel of 1725 hp driving a 1200 kw generator at 1500 rpm in a complete electric power package 24 x 8 x 11 ft, weighing 15½ tons. At the same time we have somewhat similar units ranging all the way down the line of power to simple little emergency generating sets. If with such sets we can solve some transportation problems for Alaskans we can no doubt develop many customers throughout Seward's Ice Box which is also revealing some attractive flower garden characteristics.

Utilities Like Diesels

The fear of reprisal from the utilities when packaged power is offered is quite pronounced in many circles of engine sales. However, there are two sides to this story. We may as well set straight as much of it as we can. Obviously, if a diesel driven electric generating plant is taking away some utility customers, every effort will be made to get the diesel plant out. The purchase of annoying plants is not unusual.

On the other side of the ledger we have a situation that needs some airing. The utilities fight power failures to their utmost ability. They can not afford to buy diesel operated emergency power plants and install them wherever they may be needed. However, the utilities better than any other group know the need of emergency power in all kinds of places from hospitals to chicken hatcheries. They help sell such plants and are glad to have them go in because in this way much of their responsibility for the supply of power during emergencies is taken off their own shoulders.

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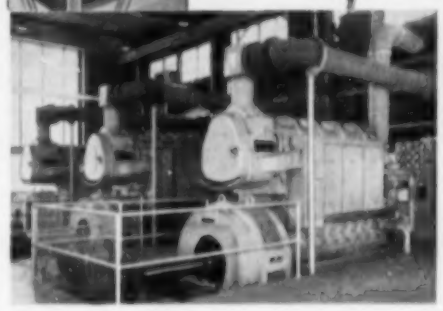

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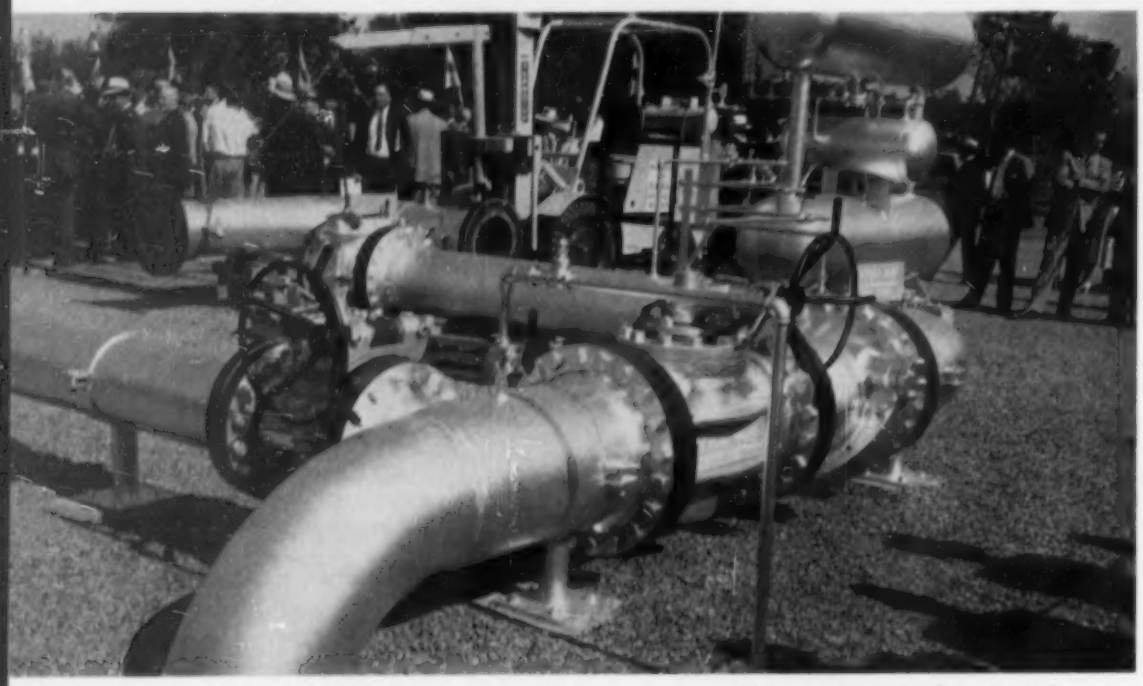
PACIFIC NORTHWEST PIPELINE OPENS

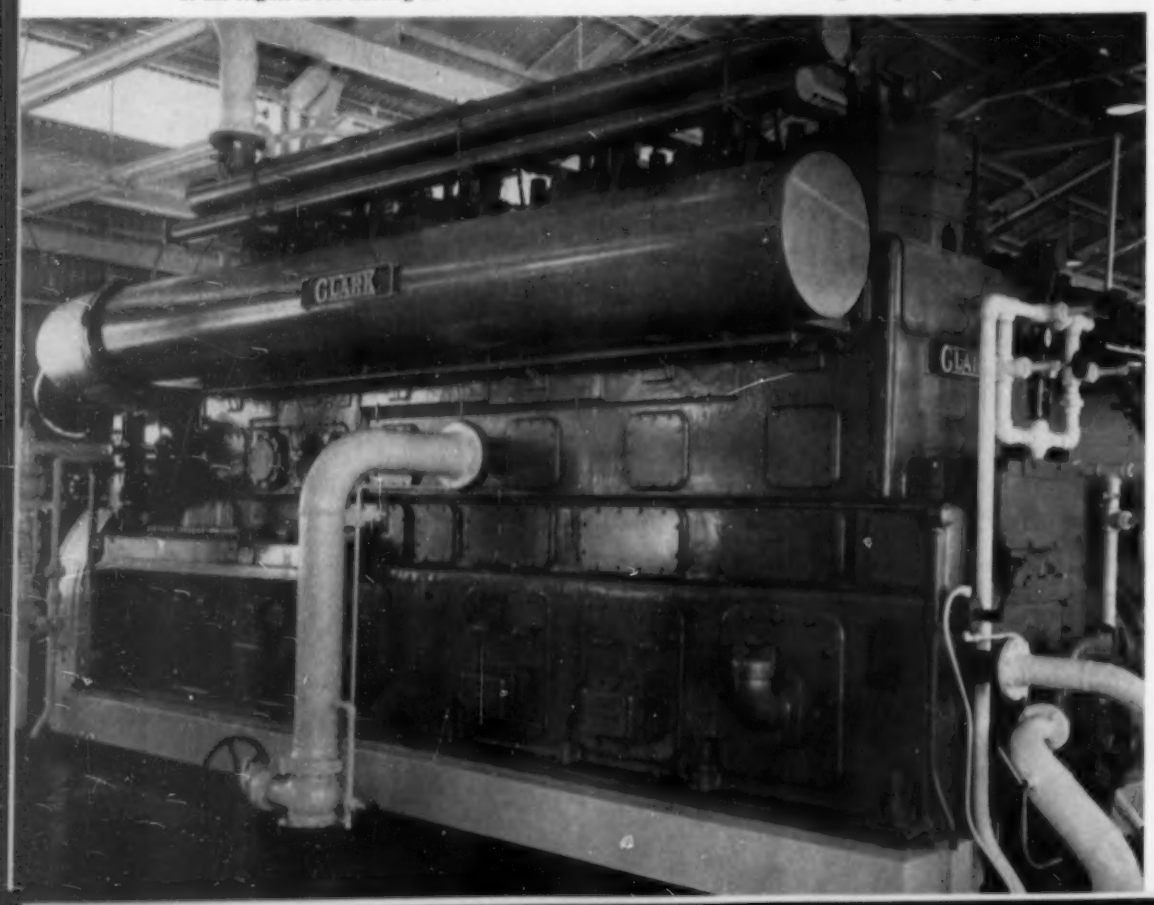
By MICHAEL T. PATE

EXERCISES held in Portland, Oregon, August 16th, signalized the arrival of natural gas from the San Juan Basin, New Mexico. Sponsored jointly by Pacific Northwest Pipeline Corporation, builder and operator of the 2,460-mile system, and Portland Gas & Coke Company, distributor for the Portland area, the celebration featured the actual bolting up of the final flange elbow in the hook-up between the two systems.

Co-hosts were Ray C. Fish, Chairman, Pacific Northwest Pipeline Corporation, with headquarters in Salt Lake City, Utah, and Charles H. Gueffroy, President, Portland Gas & Coke Company. Principal speaker at the exercises at the site of the tie-in, on Sauvies Island, adjacent to the city of Portland, was Hon. Howard Pyle, former governor of Arizona and presently Deputy Assistant to the President, Washington, D. C. Brief talks were made by both hosts and officials of both companies and the head of Fish Northwest Constructors, Inc., in charge of design, engineering and construction of the line.



The guests are moving from the speaker's stand to the manifold, where the final elbow may be seen suspended from slings, ready to be placed and bolted to symbolize completion of facilities to bring natural gas to Portland, Oregon. A bypass, in the foreground, enables service to be maintained in case of derangement of the odorizing unit, shown as three stacked cylinders at right of photograph.



Exhaust side of one of the six 6-cylinder, model TLA6 Clark compressors in the Pacific Northwest Pipeline Corporation's No. 1 station near Durango, Colorado. Cooling water enters the engine through the vertical white pipe and leaves for the cooling unit through the upper of the two parallel lines at top of view. The small line at the top of the engine is for starting air.

Following the talks, the group of more than 100 pipeline officials and some 300 dignitaries from adjacent areas moved to the site of the manifold, where the elbow joining the systems had been put in place, with three bolts left out of each flange. At the first flange the bolts were placed by Charles H. Gueffroy, Ray C. Fish and Hon. Howard Pyle. At the second flange the first bolt was handed to R. D. Ricketts, president, Fish Northwest Constructors, Inc., who turned to pass it to Cliff Turner, representing the rank and file of the organization; the second bolt was given to Mrs. A. B. Allyne, who placed it as representative of the wives of the Pacific Northwest Pipeline Corporation; with Mr. Ricketts tightening the last bolt.

A luncheon for visitors and a banquet—this last attended by over 1,000 guests, were included in the program, with Hon. Howard Pyle again making the principal and very interesting talk.

Actual delivery of natural gas from the San Juan Basin, New Mexico, and from fields along the 1,487-mile main line right-of-way, was made on September first, and initiated a change-over in Portland Gas & Coke's system which will require a progressive replacement of meters, burner tips and other equipment over several weeks time. Pacific Northwest Pipeline will have 13 compressor and booster stations along the main system and delivery laterals, with all power derived from gas engines fueled from the line's throughput. At Station No. 1, located near Durango, Colorado, and adjacent to the San Juan Basin fields, six Clark model TLA6 compressors will take field gas and force it through scrubbers and a natural gasoline plant before beginning delivery into the main line. A separate auxiliary power station, powered by Ingersoll-Rand gas engines driving generators, is a part of the gasoline plant rather than the pipeline station, but furnishes it with power for driving circulating water pumps, lighting and other requirements. Both starting and instrument air are now delivered to the pipeline from these facilities included in the gasoline plant.

Stations along the line are powered by four Clark compressors, of the same type and power rating as the initial station, but in the booster stations all auxiliary drive is from the main engines, there being no outside power available as at the Durango installation. Provision for enlarging is included at each installation site.

Top Management Named

Foster H. Pettay

M. J. Hoke

Foster H. Pettay has been elected President of the Ohio Crankshaft Company, nationally known manufacturer of diesel engine crankshafts and pioneers in the field of induction heating. Appointment of M. J. Hoke as Senior Vice President and General Manager and Paul T. Koenig as Secretary and Treasurer of the company was also announced by Board Chairman W. C. Dunn, following a recent meeting of the Board of Directors.

Mr. Pettay, who joined Ohio Crankshaft in 1941 as Assistant Secretary, served in a number of top executive positions before assuming leadership of the firm on August 1. He was made a director of the company in 1950 and was named Vice President in 1952. He became Secretary and Treasurer in 1953 prior to his appointment as Senior Vice President in 1955.

Mr. Hoke, now Senior Vice President and General Manager of the Company, was formerly Vice President and General Manager of the Camshaft and Crankshaft Division. Before joining Ohio Crankshaft in 1945 as a development engineer, he had wide experience in the engineering field with Consolidated Aircraft, the Electromotive Division of General Motors and with the Cincinnati Milling Machine Company.

Mr. Koenig, the new Secretary-Treasurer of the Company, joined Ohio Crankshaft in 1941 as an accountant. During his 15 year tenure, he has been successively Office Manager, Assistant Controller and Controller.

Midwest Representative

Edward D. Newell

The Maxim Silencer Company of Hartford, Connecticut, has announced the appiontment of Edward Dunbar Newell as Midwest Representative, with offices in the Red Cross Building, 615 Davis Street, Evanston, Illinois. Mr. Newell, an experienced mechanical engineer, was formerly Assistant Manager of Application Engineering for the Cooper-Bessemer Corp. in Mount Vernon, Ohio. Prior to his 16 years with Cooper-Bessemer he was connected with the diesel engine industry as a representative of the Bureau of Ships for four years and the U. S. Army Engineers for three years. Mr. Newell replaces E. E. Huff of E. E. Huff & Co., Evanston, Illinois, who recently resigned after having served Maxim in the Midwest for a number of years.

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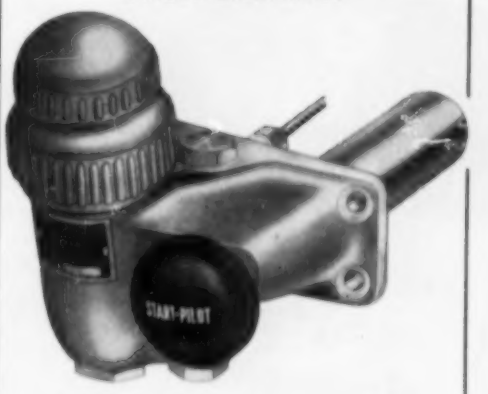

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District Manager

Appointment of Theodore Gupton as district manager at Houston, Texas has been announced by Alco Products, Inc. He had been manager of the company's Kansas City district since 1934. Gupton was born in Montgomery City, Mo., and graduated from Washington University at St. Louis with a bachelor of science degree in engineering in June, 1920. During World War I, his college education was interrupted by his two years' service as an infantry sergeant with the 35th Division.

Gupton's first job was with the Prairie Pipe Line Company at Augusta, Kansas. Interspersed with his service and schooling, he worked for that concern as assistant engineer from 1916 to 1926. He then joined the McIntosh and Seymour Corporation, an Alco predecessor company, at Auburn, N. Y. Gupton was named district sales manager at Tulsa, Okla. in 1931 and manager at Kansas City in 1934. He is a member of the American Society of Mechanical Engineers, the Missouri Society of Professional Engineers, the Engineers Club of Kansas City, and the Pipeliners Club of Tulsa.

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Highway Fleet Expansion

Merchants Motor Freight, Inc., of Minneapolis and St. Paul announces expansion of its highway transport fleet with the addition of 117 new Kenworth Cab-Beside-Engine trucks to operate on Midwest runs. Merchants Motor Freight took delivery of its new Kenworth road equipment in Denver starting in May.

A driver-training program has been established at three terminals for the drivers who will operate the new Kenworth CBE 522 trucks. The transport firm will use either 35 ft or 38 ft semi-trailers with the trucks, depending on state legal length requirements. According to President Stanley L. Wasie, "Merchants Motor Freight will utilize the new Kenworths as the backbone of our schedules serving Cleveland, Detroit, Toledo, Chicago, Omaha and Denver."

The Kenworth trucks are custom-engineered to Merchants Motor Freight requirements for light-weight, high-quality construction. The trucks ready for the road and with fifth wheel assembly have a chassis weight of 10,990 lbs each. The capacity is 71,000 lbs gross combination rating. Heat-treated aluminum alloy frames and the Kenworth all-aluminum safety cabs are among weight-saving structural components.

Powered with 200 hp Cummins Model NHB diesel engines, the trucks have five-speed transmissions. The rear suspension system is Kenworth's light-weight FTO-28, saving about 640 lbs of truck weight. This overslung spring bogey places the trailing axle in front of the drive axle, and distributes the loading over the frame at six points.

Weight distribution between the axles on these trucks is 34/66 per cent. In addition to saving weight, the short FTO-28 suspension results in almost no weight transfer between axles and eliminates bogey hopping, light or loaded.

Established in 1927 by Wasie, Merchants Motor Freight originally operated between the St. Paul-Minneapolis area and Des Moines, Iowa. Developing overnight delivery service on an interstate basis, the firm has grown steadily.

In addition to its two headquarters in Minneapolis and St. Paul, terminals are maintained at Denver, Omaha, Council Bluffs, Des Moines, Waterloo, Cedar Rapids, Davenport, Bettendorf, Kansas City, Moline, Rock Island, Chicago, Detroit, Cleveland, Toledo and St. Louis.

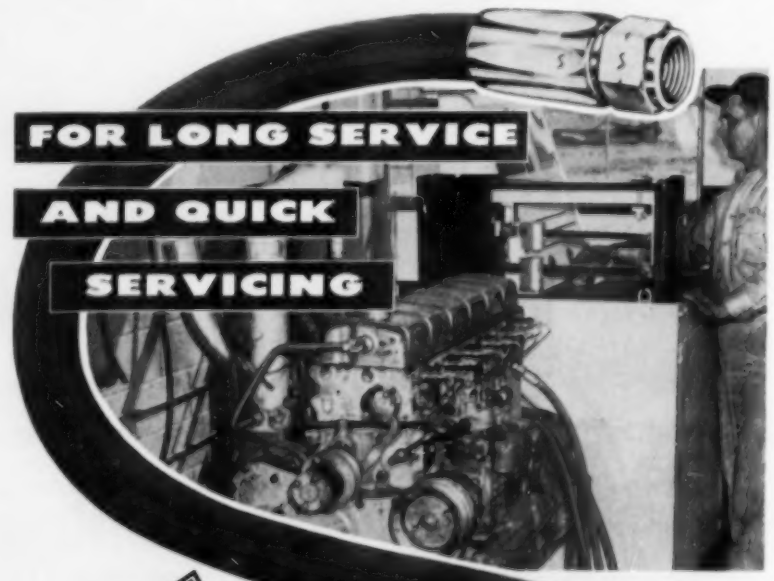
This common carrier operation began with one truck and now has in excess of 850 pieces of tractor and trailer equipment in service. The firm's dispatch books show an average of 26,000 truck-miles per day moving an average of 55 million lbs of freight per month.

General Manager

Consolidated Diesel Electric Corporation, major manufacturer of aircraft support equipment, power equipment, and industry test equipment, has named Louis B. Haberman as general manager of its Test Equipment Division.

The appointment was announced by Norman I. Schaffer, Con. Diesel president. The Test Equipment Division recently moved into separate quarters with its own sales, engineering, purchasing, production, and managerial sections. Mr. Haberman was formerly sales manager for the division.

He was formerly with Greer Hydraulic, Inc., as sales engineer on hydraulic test stands. Prior to this, Mr. Haberman was associated in an engineering capacity with Leeds and Northrup Com-



USE STRATOFLEX HOSE and FITTINGS

The truck engine shown above is hooked up on the dynamometer test stand with Stratoflex hose lines. The durability and flexibility of Stratoflex hose, and the leak-proof, quick on-and-off connections provided by Stratoflex fittings mean long trouble-free service in such applications where hose lines must be connected and disconnected frequently.

In the shop and on the road Stratoflex helps cut costs. Ask your supply dealer.

Write for Catalog S-2F

STRATOFLEX, INC.
P. O. BOX 10398 — FORT WORTH, TEXAS
Branch Plants: Los Angeles and Toronto

Sales Offices:
Atlanta
Chicago, Dayton
Houston
Kansas City
Los Angeles
New York
San Francisco
Seattle, Toronto
Tulsa

pany and Fischer and Porter Company. A graduate mechanical engineer from New York University, Mr. Haberman served as a bomber pilot with the United States Air Force from January 1943 until September 1945. He was shot down three times during his combat service and holds four decorations. Mr. Haberman will be in complete charge of the division, which produces hydraulic, pneumatic, electric, fuel and mechanical testing equipment and automation for the aviation industry. Recently, Con. Diesel's Test Equipment Division began building test stands for diesel fuel injection pumps, automotive production, and automatic test equipment for general industry application.

Scanning Spectrometer

A newly developed low-cost grating type Scanning Spectrometer is now in production at the laboratories of the Jarrell-Ash Co., Newtonville, Massachusetts. Advanced optical design results in a first order reciprocal linear dispersion of 16 Angstroms/mm at the exit slit, with a minimum resolution of 0.2 Angstroms. Easily adapted for use as a flame spectrometer—capable of detecting impurities to one part per billion—the new Model 8200 Jaco-Ebert 0.5 Meter Scanning Spectrometer is ideal for a wide range of research studies including analyses of petroleum products for additives, catalysts, derivatives, detection of wear metals in lubricating oils; analyses of boiler feed water, plating solutions, fertilizers, biological and pharmaceutical materials, foods, plus a host of other trace element determinations.

Among the many features incorporated into the Jaco Model 8200 is a linear wavelength scanning mechanism which requires only a simple Veeder-Root counter to indicate first order wavelength. A built-in 8-speed motor drive permits variable speed scanning in either direction, with manual drive also provided. The Jaco-Ebert Scanning Spectrometer serves as an excellent source of narrow band-pass high intensity monochromatic light, and is well suited for investigations of band structure from various sources, isotope abundance ratios, plus studies of spectral energy distribution. The use of an Ebert Mounting results in compactness of design—the unit measures only 18 inches long, weighs approximately 20 pounds—and affords extreme ease in changing wavelength settings.

The Jaco-Ebert Scanning Spectrometer is also available with a choice of two electronic systems for either direct recording of spectral intensities or for absorption studies. The first is an extremely high sensitivity system for plotting absolute intensity against wavelength, using a strip chart recorder. The second system is used for ratio recordings where the ratio of the total source intensity, relative to the spectral intensity, is plotted on a strip chart recorder. This latter system is desirable for sources which fluctuate widely with respect to time. Readers are invited to write for further information on the Model 8200 Jaco-Ebert Scanning Spectrometer. Address: Jarrell-Ash Company, 26 Farwell Street, Newtonville 60, Massachusetts.

Old-Timer Gets A Diesel

On the eve of celebrating 100 years of service on Chesapeake Bay the 100-foot *Major Henry Brewerton* has been repowered by a 6-110 GM Detroit diesel engine. Built in 1857 the craft has had a varied career ranging from towing car floats for the Baltimore and Ohio Railroad to transporting fish scrap from Virginia menhaden plants. She is presently operated by the Standard Products Company of Whitestone, Va. The craft was repowered by Western Branch Diesel of West Norfolk. The diesel turns a 48-in. x 34-in. three-bladed wheel through 3.75 to 1 reduction gears.

INDEPENDENT LABORATORY TESTS PROVE—

AIR-MAZE OIL BATH AIR FILTER STOPS 59% MORE FINE ARIZONA ROAD DUST THAN NEXT BEST FILTERING DEVICE!

Here's dramatic evidence of why power assembly life is greatly extended with Air-Maze oil bath air filters: An impartial testing laboratory compared the Air-Maze oil bath air filter with competitive filters. The results show that *the Air-Maze oil bath air filter removes 59% more fine Arizona road dust than the next best filtering device!*

The tests also showed that the Air-Maze oil bath air filter *maintains at least 95% efficiency even at the lowest locomotive engine speeds!* Proof positive that the Air-Maze oil bath filter doesn't depend on high air velocity to deliver top performance!

Because of facts like these, dozens of the leading railroads across the country are switching to Air-Maze oil bath air filters. They've found that this type of filter is a time tested and proven way of extending power assembly life, providing longer period without servicing, reducing downtime and cutting engine maintenance costs!

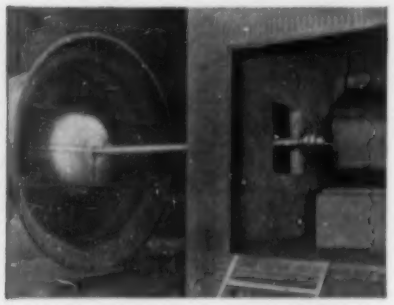
For further information on how Air-Maze oil bath filters can give *you* 59% greater filtering efficiency at less cost—call on us today! Air-Maze Corporation, 25000 Miles Rd., Cleveland 28, Ohio.

Typical Air-Maze oil bath filter that saves on engine wear and filter maintenance—pays for itself in less than a year.

The biggest names in diesels are protected by Air-Maze filters

ENGINE AIR FILTERS
CAR BODY FILTERS
AIR-MAZE
LUBE OIL FILTERS
PASSENGER CAR FILTERS
The Filter Engineers

Eliminate Intermediate Bearings!



By using Thomas Flexible Couplings on long, unsupported shafts, intermediate bearings are eliminated. Thomas engineers tubular shafts free from lateral whip.

The large fan shown above is 16' from the motor to allow sufficient air intake. Miners working underground receive their fresh air supply from this fan and others like it, which have been giving dependable service for as long as fifteen years . . . without shutdowns for lubrication or maintenance of the couplings.

Thomas floating shaft flexible couplings are recommended for machine and marine drives, printing presses, paper and cement mills, cooling towers, diesel engines, pumps, compressors, and many other uses.

Only Thomas Flexible Couplings offer *all* these advantages

UNDER LOAD and MISALIGNMENT

1. Freedom from Backlash—Torsional Rigidity
2. Free End Float
3. Smooth Continuous Drive with Constant Rotational Velocity
4. Visual Inspection in Operation
5. Original Balance for Life . . . *and*

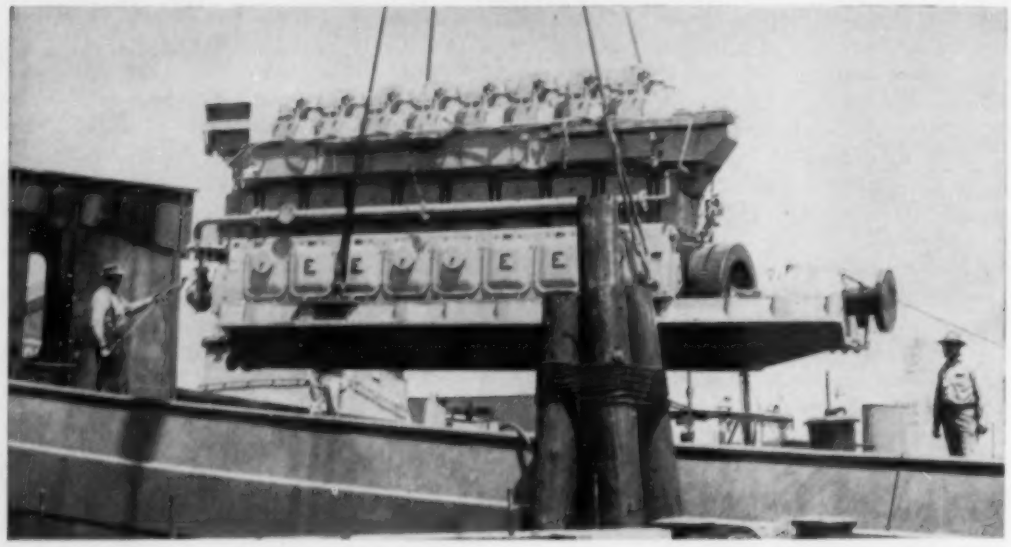
Thomas All Metal Couplings have No Wearing Parts so Lubrication and Maintenance are Eliminated

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING CO.

WARREN, PENNSYLVANIA, U.S.A.

Diesel For Sea-Going Tug



2000 hp Enterprise diesel being lowered into the *Sea Giant*.

The *Sea Giant*, prototype of a new class of seagoing tugboats, took a major step toward completion late in June when her 2,000-hp Enterprise DMR-38 diesel propulsion plant was installed at the yard of Pacific Dry Dock & Repair Co. in Oakland, California. Strongman of the operation was a 100-ton A-frame derrick barge owned by Smith Rice Co. of San Francisco, which picked up the 55-ton engine with ease and lowered it smoothly into the *Sea Giant's* 125-foot hull. According to the new vessel's owners, Shipowners & Merchants Towboat Co. Ltd. of San Francisco, the *Sea Giant* completely outstrips any tug ever built on San Francisco Bay, whether you measure her size, her power plant, or her capabilities. She is 125 ft 9 in. in overall length, with a beam of 28 ft and a draft of 16 ft.

The main engine, an eight-cylinder diesel with 17x21-in. bore and stroke, was built by Enterprise Engine & Machinery Co. Rated 2,000 hp at 300 rpm., it gains additional power from a turbocharger and swings a Doran propellor that weighs 4,500 lb and is over 9 ft in diameter. Fuel tanks have a capacity of 50,000 gallons, plenty for 40 days of typical service towing cargo barges between coastal ports, or for an emergency run to a distressed ship far off shore.

Engine installations are climactic moments in the shipbuilding business, so there was a full crowd on hand, headed by Joe O'Leary, port engineer for Shipowners & Merchants. Closely timed to take advantage of tides in the Oakland Estuary, the big Smith-Rice barge moved into position first, and with smart maneuvering under the direction of George F. Mitchel, chief engineer, lifted the waiting engine from dockside and laid it on the barge deck, ready to go. When the *Sea Giant's* empty steel hull was towed into place, rigger foreman Knute Peterson took a careful check of her trim, then called for wire rope lifting slings that would let the big Enterprise diesel engine hang at the same angle and come to rest evenly in the tugboat hull.

After that, the burden was on the barge winch controlled by operating engineer Jay Northrup. Sharp, precise whistle signals from Peterson guided the lift, with some human muscle and skill provided in the tight spots by riggers Matt Cole and Jim Morgan. Getting the dangling 55-ton engine, 27 ft long and 6 ft wide, through the cut-away deck of the tugboat was the first tight spot. Tug and barge were snubbed tightly together by manila hawsers, but there was still some motion between them. With only inches to spare, the diesel was lowered steadily and unerringly, not losing a bit of its gray paint. Final alignment of a marine engine and its propellor shaft is a precise art, but Peterson saved a lot of trouble later on by his care in initial setting of the engine. Holding the engine only inches away from its rails, he called for careful pulls on the taglines and a quick turn of each on the engine room stanchions, bringing the 8-cylinder engine almost exactly over the marks for its last, gentle drop into place.

Along with Joe O'Leary, plenty of other authoritative spectators followed Peterson's work with critical but approving eyes. Among them were Earl Wiley, yard superintendent of Pacific Dry Dock & Repair Co., where the installation was done; Don Faber, naval architect for Pacific Coast Engineering Co., builders of the *Sea Giant;* Carl Kroger of Shipowners & Merchants, who'll be chief engineer aboard the new tug; Vic Atkins, manager of Doran Co., propellor manufacturer, Oakland; George Anger, district manager for Enterprise Engine & Machinery Co., San Francisco; and A. E. (Mac) Macomber and Glenn Levering who are Enterprise service engineers.

Designed by L. C. Norgaard & Associates, San Francisco naval architects, the *Sea Giant* boasts a bluff bow that rises sharply above the water for service in any weather. But below the surface there are exceptionally fine lines for efficient cruising and towing service. For handling any towing situation that comes along, the *Sea Giant* will be equipped with a Markey towing engine and double drum winch, powered hydraulically. One drum will carry 2,800 ft of 1¼-in. wire rope, the other, 2,000 ft of 2-in. An engineering feature of the *Sea Giant* is her skin cooling—880 sq ft of shallow tanks formed in the engine room by inner and outer steel plating about 6 inches apart.

Business Good in B. C.

TWO 30 kw diesel alternator sets for auxiliaries on board the Gulf Island Ferry Company vessel *Motor Princess*.

DELIVERY of one of three 20 kw diesel generator sets for Royal Canadian Navy Tugs.

DELIVERY of a General Motors 12-110, 440 hp Tandem Twin General Motors marine diesel engine for installation in Vancouver Tug Boat Company Limited Tug *La Bonne*.

TO JOHN MANLY Limited, Shipyards in New Westminster, two 4-51 General Motors 87 hp marine engines for 16 ft boom boats being built for Cattermole & Tretheway, who will be using them on their Buttle Lake project.

DELIVERY of a General Motors 6-110, 220 hp marine diesel engine for the Royal Canadian Air Force vessel, *Nimpkish*.

GENERAL MOTORS 6-71, 147 hp marine diesel engine for installation in the fishing vessel *Kennfalls*.

MADILL Shipyards in Nanaimo through Nanaimo Diesel Sales, a General Motors 68 hp series 3-71 marine diesel engine for a new steel tug being built for Moore & Whittington of Victoria.

TO COLUMBIA Cellulose, Prince Rupert, B.C., through Bytown Machine Works, a General Motors Series 4-51, 87 hp marine diesel engine for installation in a steel boat.

TWO TANDEM Twin Series 71 engines developing 295 hp each were sold to Percy Pierce and also Johnny Johnson, fishermen for the Prince Rupert Co-op in Prince Rupert, B.C. for a new 72 ft seine boat being built by Matsumoto Shipyards at Dollarton, B.C.

General Sales Manager

Nelson Muffler Corporation of Stoughton, Wisconsin has announced the appointment of Joe F. Gettrust as General Sales Manager. Mr. Gettrust comes to Nelson with over 20 years experience in the heavy duty automotive field as well as in industrial power plant applications. He formerly was associated with the Flexible Company, Loudonville, Ohio as Western Division Sales Manager.

Temp. Control for Big Engine

The new Enterprise RV-16 vee type diesel, described in the September, 1956 issue of DIESEL PROGRESS features a 6 in. Amot thermostat for coolant temperature control. This engine has a 4 in. water pipe coming from each bank of cylinders and discharging into a common 6 in. line, a big job for the thermostatic control.

Booklet on Engine Line

Cleveland Diesel Engine Division of GM has announced a new and informative booklet describing their complete line of diesel engines. In the last year the product line of Cleveland Diesel has been broadened to fit every type of marine and industrial equipment application for heavy duty diesel engines.

This booklet gives full information on the new Cleveland Diesel turbocharged two cycle diesels also. Write to Cleveland Diesel Engine Division, 2160 W. 106th St., Cleveland 11, Ohio for the booklet. (ITS NEW)

Service Manager

J. Robert Jackson has been appointed service manager of the Harrison Radiator Division, General Motors Corporation, according to Edward J. Reilly, general sales manager. "Mr. Jackson, in his new capacity," Mr. Reilly said, "will work in close contact with purchasers of Harrison products to insure customer satisfaction."

For automobiles Harrison makes radiators, heaters, defrosters, air conditioning systems and thermostats. It also manufactures heat transfer units designed for airplanes, ships, railway cars and locomotives, for tanks and tractors and for various industrial and power plant uses. Mr. Jackson joined Harrison in November, 1939, as a service clerk.

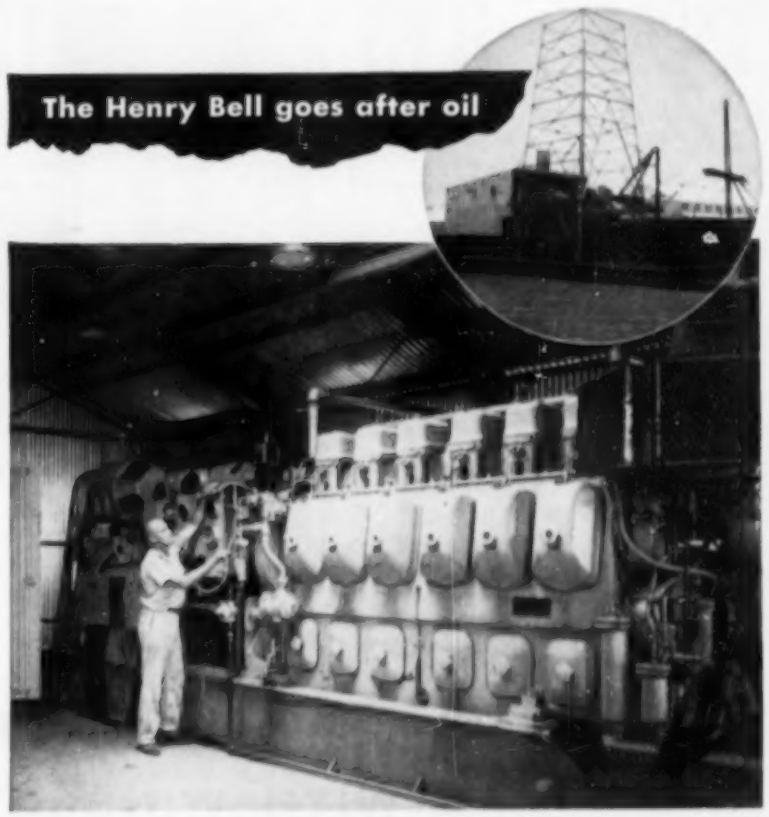
He was named office manager of service in July, 1944. From November, 1945, when he became a sales field service engineer, until October, 1954, he held various sales-engineering positions including that of supervisor of defense contracts. Before his new appointment he was sales engineer.

SRDS Approves VAC Audits

LOS ANGELES, CALIF. – John B. Knight, President of the Verified Audit Circulation Company, announced receipt of formal notification from the publishers of Standard Rate & Data Service of their acceptance of VAC circulation audits for publication in both the consumer and business publication sections of their national advertising rate and data service. The VAC insignia will now be carried in SRDS for all publications subscribing to the VAC auditing service.

"This notification climaxes a 4½-year struggle for acceptance of VAC-audited publishers", Knight said. "We are all very pleased with the SRDS action, indicating as it does their recognition of the validity of the VAC audit and verification process—which for the first time incorporates modern research techniques in the field of publication auditing."

The VAC audit is distinguished from other recognized auditing services because it is the only audit that makes verification of the circulation list mandatory, and is the only audit that tells the advertiser how many people on the circulation list actually received the magazine and find it useful to them in their business. DIESEL PROGRESS is a charter member of VAC.



. . . protected by NUGENT FILTERS

This installation is in the main engine room on The Henry Bell, modern offshore drilling rig, operating in the marshland oil fields of Louisiana.

The crew lives aboard, therefore, the two compact diesel-electric power units, designed by Alco Products Co., Inc., are required to supply power not only for the rig, but for lighting, cooking and air conditioning.

To protect the diesels, Alco incorporates Nugent lube and fuel oil filters in their design. Dirt and carbon are prevented from reaching vital engine parts by utilizing Nugent full flow strainers and by-pass filters on the lube oil system. Fuel oil is also Nugent filtered to remove impurities that could clog injection nozzles and cause faulty combustion.

This is the kind of protection any engine needs—on land or on water. Whatever your filtering requirements, there's always a Nugent Filter available ... at low cost ... of proper size and type.

Let us show you how Nugent Filters can improve engine efficiency ... why they are standard equipment on so many leading diesel engines.

Write TODAY for descriptive literature, outlining your requirements.

Wm. W. Nugent & Co., Inc.
3441 Cleveland St. Skokie, Illinois

Established 1897

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Mid-Continent Diesel News

By Jack F. Cozier

STATE OF Oklahoma, Tulsa district, has taken delivery on two Allis-Chalmers TL-10 tractomotive loaders and two model 45 Allis-Chalmers motor graders-part of an order for the entire state of ten TL-10 Allis-Chalmers tractomotive loaders and eight model 45 Allis-Chalmers motor graders all sold by the Boardman Co., Oklahoma City and Tulsa, Okla.

BILL BRISTOW, oil field trucker, Wichita Falls, Tex., has in operation two trucks, one an Autocar and the other an International, powered by Cummins NHB-600 diesel engines. Bristow operates throughout the Southwest.

CURRY Motor Freight Lines, Inc., Amarillo, Tex., recently added six new International trucks powered by Cummins HRFB diesel engines, to help cover eight new locations in West Texas added by a recent extension of service.

APACHE Contractors, Inc., Tulsa, Okla., bought a Cat D7 tractor with an angle bulldozer blade from McCormick Machinery Co., Tulsa. The tractor will be used in pipeline-right-of-way work.

A. G. SHERWOOD Construction Co., Bartlesville, Okla., purchased a Euclid S7 overhung scraper powered by a GM 471 diesel engine. The unit sold by Butler-Sparks Equipment Co., Tulsa, will be used for town and street work in Bartlesville.

STANDARD Industries, Tulsa, Okla., has bought two Cat D7 tractors with bulldozers for highway construction work. The sale was made by McCormick Machinery Co., Tulsa.

A B C CONSTRUCTION Co., Tulsa, Okla., bought a Koehring 305 back hoe powered by an International UD 525 diesel engine from Clarence L. Boyd Co., Tulsa. The unit will be used for sewer ditching in Vinita, Okla.

STATE of Oklahoma, Antlers, Okla., received two Cat No. 12 diesel motor graders for highway maintenance and improvement. The units were received from McCormick Machinery Co., Tulsa.

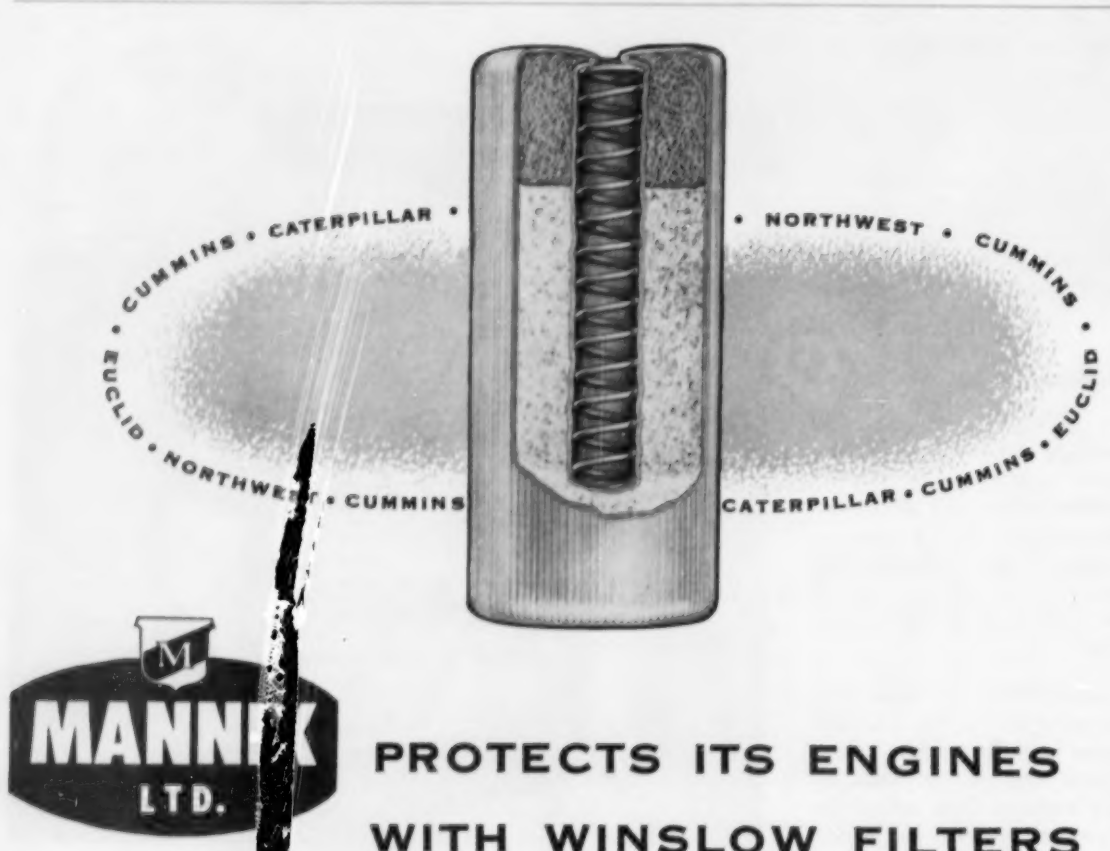
STANOLIND Oil & Gas Co., County Line, Okla., purchased a LeRoi L-3000 natural gas engine driving a Peerless 1200 ft deep-well turbine pump. The 450 gpm unit was delivered by Carson Machine & Supply Co., Oklahoma City, Okla., to be used on a water flood operation.

DARR Equipment Co., Dallas, Tex., purchased a 1924 model 2-ton Caterpillar tractor originally manufactured by Holt Caterpillar Co., Stockton, Cal., parent company the present Caterpillar Co. The 1924 model has been reconditioned and is now on display at Darr's Caterpillar showroom.

SOUTHERN & Central Railway, Peru, South America, has ordered six World diesel-electric locomotives from Alco Products, Inc. This new 1800 hp locomotive model DL 500, has a new Alco model 251, 12-cylinder, Vee-type diesel engine.

WADE LAHAR Construction Co., Tulsa, Okla., bought a model 34 Lima back hoe from R. A. Young & Son, Inc., Tulsa, for water line work in West Tulsa. The unit is powered by a 471 GM diesel engine with an Allison torque converter.

EL PASO Natural Gas Co., El Paso, Tex., has been granted authority to construct and operate natural gas facilities in Andrews and Ector counties in Texas. The operation will include about 65



PROTECTS ITS ENGINES WITH WINSLOW FILTERS

Mannix Ltd., operators of one of the largest machinery pools in North America, last year standardized on Winslow CP* elements for practically all powered equipment. Engine filters are stenciled to identify the correct filter element, and maintenance men and operators are provided with cross reference manuals that also specify the elements to be used.

According to Mannix service records, Winslow Filters have improved both the useful life of oil and the life of equipment, and the standardization program has shown advantages in efficiency and economy. The principal gain has been in longer periods between engine overhauls, and reduced repair costs and operating expense for many types of powered equipment.

WINSLOW FILTERS

CP (controlled pressure) is protected by patents and trademarks.*

Winslow Engineering and Manufacturing Co. 4069 Hollis Street • Oakland 8, California

miles of gathering lines, a compressor station, and other facilities.

FRIX & BRISCH, Muskogee, Okla., purchased a Cat No. 12 diesel motor grader from McCormick Machinery Co., Tulsa, to be used for state road surfacing.

LAYMAN & Son Construction Co., Tulsa, Okla., has bought a Euclid S7 overhung scraper powered by a GM 471 diesel engine for use in town and street work in Tulsa. The sale was completed by Butler-Sparks Equipment Co., Tulsa.

WALKER-NEER Mfg. Co., Wichita Falls, Tex., recently made news in the oil industry by combining a Cummins NHRPS-600 diesel engine with a Fawick 0-14CB400 power take-off to power a slush pump on a combination spudder and rotary rig manufactured by Walker-Neer.

McMICHAEL Construction Co., Tulsa, Okla., has purchased a Cat 955 diesel traxcavator for city streets paving and surfacing. The sale was made by McCormick Machinery Co., Tulsa.

Centrifuge Literature

Heavy duty as well as standard nozzle type centrifuges for use in clarification, separation and solids concentration are described in Bulletin 1279 recently issued by The Sharples Corporation, Philadelphia, Pennsylvania. In addition to a complete description of the function and application of both types of Nozljectors, the Bulletin describes the method employed to effect high solids concentration and dryness of solids. Centrifuges are described which are capable of handling loads requiring 20 to 50 hp, in even the most severe service. For a copy of Bulletin No. 1279 write to The Sharples Corporation, Dept. 318, 2300 Westmoreland Street, Philadelphia 40, Pa.

ITS NEW

Westinghouse Air Brake President

E. O. Boshell, Chairman of the Board, Westinghouse Air Brake Company, has announced the election of A. King McCord as President. Mr. McCord succeeds Mr. Boshell who has been serving as both Chairman of the Board and President since joining Westinghouse Air Brake in 1951. "The diversification program for the company has brought enlarged responsibilities to these offices and it is desirable to separate the functions of the President and the Chairman of the Board," Mr. Boshell stated. "Sales for the first six months of 1956 were $113,164,008—up 41 percent over the same period of 1955. A $200 million year is in prospect for the 87-year-old company founded by George Westinghouse upon the invention of the railroad air brake. Today more than half of the sales dollar comes from non-railroad businesses," Mr. Boshell said.

A. King McCord has been President since 1950 of the Oliver Corporation, producer of agricultural and construction equipment. He started with the company as an attorney in 1930 after education at Beloit College and the Harvard and University of Chicago Law Schools. Successively he served the corporation as assistant secretary, and general counsel, vice president and director, first vice president and executive vice president. During World War II and the Korean crisis, Mr. McCord served in Washington with various government agencies. He has been active in the Farm Equipment Institute and is a member of Phi Alpha Delta, Sigma Delta Rho, Sigma Chi, and the University Club, Executive Club and Economic Club, all of Chicago. Mr. Boshell, who remains as Chairman of the Board, announced that Mr. McCord assumed his new duties as President and Chief Executive Officer September 1.

DIESEL ENGINE TROUBLE CHART

POOR COMBUSTION:

Possible Cause

- Wrong fuel
- Wrong injection timing
- Sediment or slugs of water in fuel
- Leaky injection valve
- Carbon on injector
- Overheated injector
- Improper size orifice
- Subnormal compression temperature
- Injector valve sticking
- Weak injector valve spring
- Air in fuel lines
- Incorrect valve timing
- Leaky valve or valves
- Stuck piston rings
- Subnormal water jacket temperatures
- Worn cylinders
- Intake or exhaust ports clogged (2 cycle engines)
- Light loads
- Cold intake air
- Overlubricated cylinder walls

EXHAUST SMOKE:

Possible Cause

- Weak compression
- Sticking or worn nozzle
- Cetane fuel too low
- Excessive amount of oil reaching combustion chamber
- Unequal power output of cylinder
- Dirty air filter or silencer
- Misfiring
- Leaky inlet or exhaust
- Inadequate air supply
- Sticky or worn piston rings
- Inlet air or jacket water too cool
- Worn or scored cylinders

HIGH OIL TEMPERATURE:

Possible Cause

- Overheated bearing surfaces
- Not enough oil in circulation
- High water jacket temperatures
- Crankcase insufficiently cooled
- Plugged oil cooler
- Oil badly contaminated
- Late combustion
- Overloading

ENGINE OVERHEATS:

Possible Cause

- Lack of cooling water
- Incrustations in water jacket
- Obstruction to circulation of the water
- Damage to water pump
- Fuel injection too late
- Inadequate lubrication

CYLINDER WEAR:

Possible Cause

- Corrosion caused by water from products of combustion or by leaky head gasket
- Abrasive material from dust in air
- Sulphur loaded fuel
- Insufficient or incorrect oil
- Overheating
- Blow-by
- Frequent cold starts
- Piston ring pressure too high
- Misaligned connecting rod
- Cylinder distortion

HIGH OIL CONSUMPTION:

Possible Cause

- Loose bearing fits (in pressure system)
- Excess oil reaching cylinders
- Bearing end play excessive
- Plugged oil wiper rings
- Oil pressure too high
- Oil diluted with fuel
- Oil leaks
- Piston rings not fitting properly
- High oil temperature

CITIES SERVICE C-300 DIESEL OIL: ANSWER TO MANY PROBLEMS!

As is evident by the chart, many problems experienced with diesel engines can result from insufficient lubrication or the use of an unsuitable oil.

To avoid these problems before they begin, an increasing number of diesel operations have switched to Cities Service C-300 Diesel Oil. The reason: Cities Service C-300 is made from the finest base oils to conform to Military Specification MIL-0-2104A . . . is high detergent and high dispersant . . . strongly fortified against oxidation and corrosion.

But results are what count and here are the outstanding results reported by users of Cities Service Diesel Oil. Says a leading power plant: "We get 23,205 brake horsepower hours per gallon of lube oil." Says another: "Engine compressions are the same after four years as after three months; liners worn only .0015"." And still another reports over 30,000 hours of use on its Nordbergs—six years without any appreciable wear using Cities Service Diesel Oil!

In short, users are unanimous in praising Cities Service Diesel Oil as the finest they've ever used. Try it and you'll agree. Talk with your nearby Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

COMBUSTION CHAMBER DEPOSITS:

Possible Cause

- Dust from air
- Imperfect combustion
- Unsuitable oil

ENGINE ROUGHNESS:

Possible Cause

- Imperfect injection
- Cetane number of fuel too low
- Injection timed too early

SUDDEN STOPPAGE:

Possible Cause

- No fuel
- Water or air in fuel line
- Too heavy fuel
- Dirt or gum in fuel
- Plugged fuel line
- Lubrication failure
- Overheated engine
- Seized or tightened moving part of engine

Florida Diesel News

By **Ed Dennis**

TWO Waukesha dieselized generating units for the 96 ft *Alisa V*. The model 185 DLC diesels are rated 34 bhp at 1200 rpm. The complete Kohler set is rated 15 kw, being built at Broward Marine of Ft. Lauderdale.

DEERFIELD Rock Corp. of Deerfield Beach recently received 5 Euclid bottom dumps model 91 FDA powered with General Motors 6-71 diesel engines.

AN Allis-Chalmers tractor shovel HD 5 with 2 large Krogman filters for the hydraulic system to be used on a sewer project being dug by Central-Florida Construction Co. of Stewart.

THE *Orion*, one of the world's largest motor yachts, left Miami for dry docking in Jacksonville. This 337 ft yacht was built in Kiel, Germany in 1929 and during W. W. II saw action in the naval service. Powered by two 1800 Krupp diesels, the generating plant has a 300 hp General Motors diesel. It is now owned by the McCormick Shipping Co. of Panama.

THE GIBBS Corp. at Jacksonville, delivered the *M. V. Ceres* to the Murmanville Corp. for offshore drilling operations in the Gulf of Mexico. The 130 ft hull was converted from an unpowered barge to a supply vessel, powered with two General Motors diesels model 12-567 each 900 hp.

MIAMI Transit Co. and the Miami Beach Railway Co. took delivery of 35 General Motors 51 passenger busses powered with the 6-71 series diesel engines and torque converters. They cost $22,000 each. This makes a total of 305 dieselized busses which carry more than 48,000,000 passengers over 12 million miles annually.

RYDER Trucking Co. of Miami and Jacksonville took delivery of 10 model DCO 205 International cab over engine hiway tractors, powered with model JT6B Cummins diesel engines each rated 175 hp.

DADE Drydock Co. is building another multi-purpose 140 ft cargo vessel. This one to go to the Foster Construction Co. of Costa Rica, C. A. It is powered with two model D375 Caterpillar diesels and two 19 kva Caterpillar generating sets (see D. P. July '56).

A MODEL BAB 128 Murphy diesel will power the newly launched *Miss Edisto* of South Carolina, while a General Motors 6-71 was selected for the *Allie B;* both are 55 ft shrimp trawlers and were built by the Morehead City Shipbuilding Corp.

30 Fairbanks-Morse model 49B4½ diesel generating sets were sold to the Corps of Engineers at Jacksonville. They are to be installed at several locations along the Florida coast in connection with the guided missiles program.

A Le Tourneau-Westinghouse Tournacrane, with power supplied by a General Motors 4-71 diesel in a Turnapull tractor, from Societe Nationale de Commerce for use on the docks at Port au Prince, Haiti.

TWO International dieselized 20 kw Ready-Power generating units mounted on a truck have been added to the power plant at Gonaives, Haiti, to help during the peak load period. The three 2 cyl. Fairbanks-Morse 97 kva diesel generating sets take care of the normal day load.

NORTH Broward General Hospital received, for emergency use a twin 6-71 General Motors diesel generating unit model 12203 with a 200 kw generator.

A UD525 International diesel in a 118 Galion motor grader for Ward & Han-

CFC

COMPLETE FILTRATION COVERAGE

there's a Commercial Filters unit engineered for your filtering job...

Fulflo FILTERS

Fulflo Filters provide optimum clarity at ultra-high flow rates. For all industrial fluids—including oils, liquid fuels, chemicals, water, compressed air and various gases. Sizes to handle flow rates up to 1,600 gpm. Pressures to 4,000 psi.

Fulflo Filters feature Honeycomb Filter Tubes, the "precision controlled density" element that filters every drop again and again to give you microscopic clarity. Choice of cotton, acetate, nylon, orlon, dacron, dynel or glass fibres.

Standard models available in steel, stainless steel, rubber lined steel or nickel-plated brass. Custom models engineered to special requirements.

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Honan-Crane Filters offer "clean oil" filtration in diesel, turbine, hydraulic, metalworking and quenching operations. Bulk refill models provide depth filtration with cellulose medium for additive oils and Cranite (fullers earth) medium for straigth mineral oils. Multi-cartridge models feature six different types of cartridges that may be used interchangeably depending on type and degree of filtration desired. Flo-Pac models, installed in line, handle flow rates up to 900 gpm. All have quick-opening covers for ease in changing refills.

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Diesel and gasoline engines get complete protection against the damaging effects of dirty oil with Michiana Lube and Fuel Oil Filters. Designed for low cost filtration and proven in thousands of installations. "Throw-away" or repackable filter elements. Available in a wide range of sizes and models.

Write for literature or engineering help covering your filtration problem.

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COMMERCIAL FILTERS CORPORATION

MELROSE, MASSACHUSETTS • LEBANON, INDIANA

cock of Stuart plus a TD9 International dieselized Drott loader for Bramsfield & White from Florida-Georgia Tractor Co.

THE TILIOKOS Boatbuilding Co. of Fernandina Beach built the first 3 of what will be a 6 trawler fleet of shrimpers, the *Tide, Wave* and *Surf*, for the Colonial Shrimp Co. of Southport, N.C. All are 54x15½ ft and powered with model D8800 Caterpillar diesels. These will be followed by the *Crest, Swell* and *Sea Rambler*.

ALL 7 trawlers of the new Lyco shrimp fleet have Onan model 3 DSP 3 kw diesel generating units. These were built by the Diesel Engine Sales of St. Augustine and have General Motors 6-110 diesels for main propulsion.

THE WEST India Shipping Co. is having the *Mayhaven* repowered with a model D397 Caterpillar diesel rated at 500 hp. This is a sister ship of the *Maycrest* and both are ex China coastal freighters. The work is being done at Dade Drydock Corp.

RECENT General Motors diesel installations in Broward County construction equipment included a 4-71 in a Pettebone Mulliken #250D loader for Curie Bros. of Hallendale and a 3-71 in a Galion grader for the Florida State Turnpike Authority.

THE NEWLY launched 82 ft *Kingfish*, powered with a 240 hp Buda diesel was built by the Williston Boat Works. A BDG 77 Buda supplies power for the bilge pump, air compressor and a 7½ kw generator. Westinghouse air controls are used on the engines.

Plastic Boat from Scotland

A glass reinforced polyester diesel driven lifeboat built in Glasgow, Scotland is strong, seaworthy and lighter than metal or wood. It is 24 ft long, 8 ft wide and the moulded depth is 3 ft 4 in. With a boat that is only three times as long as it is wide, not much can be expected by way of speed under power. However, with a 15 hp diesel it will do 6 knots. That is as fast as it can be driven no matter how much power is installed according to Mechans, Ltd., the builders. With a capacity to carry 40 persons and with an 8 hp engine installed, the total weight is 2400 lbs. This is about 300 lbs lighter than similar boats of aluminum construction. The Ministry of Transport dictates the design of such boats and builders are not permitted to depart from such design.

The construction is of conventional lay-up method within a mould. The laminate is built up from one layer of scrim cloth and four layers of 2-oz chopped strand mat. The outer surface embodies a white pigmented gel coat and during the lay-up process fire retardent is added. Pre-moulded buoyancy tanks extend the full length of the hull on each side giving longitudinal strength and forming seats joined at bow and stern with more tanks which add to the buoyancy. There are three thwarts of moulded channel form giving extreme rigidity while additional rigidity across the beam is attained with hollow rectangular section bulkhead also moulded in. The remarkable strength of the boat is reflected in tests wherein an overload of 100% more than weight of 40 passengers and equipment is carried from lifting hooks at each end with only $\frac{1}{16}$ in. deflection and $\frac{1}{16}$ in. spread.

NOW AVAILABLE! The Completely new Volume 21 of **DIESEL ENGINE CATALOG.** This giant, fully illustrated reference book containing complete and detailed engine and accessory sections is bigger, better than ever before. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company order forms to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, California.

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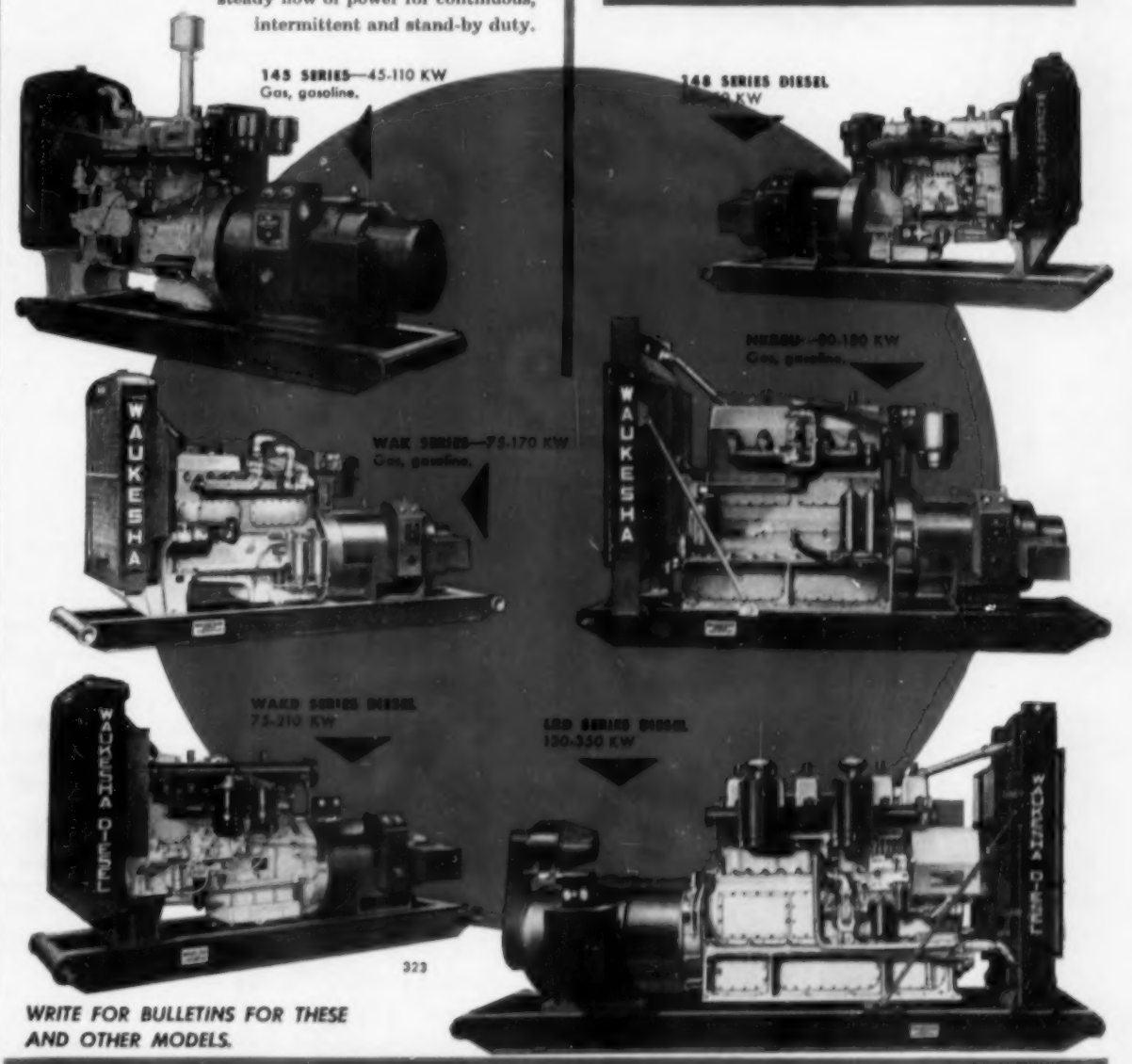

WRITE FOR BULLETINS FOR THESE AND OTHER MODELS.

WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN RAILWAY DIVISION

Northeastern Diesel Notes

By Arnold B. Newell

WITH the steel strike over and steel deliveries resuming, the R. T. C. Shipyard at Camden, N. J. laid the keel of the first of three 1800 hp tugs for Dalzelle Towing Company of New York City. These boats were designed by Tom Bowes of Philadelphia to be powered by Fairbanks Morse opposed-piston diesels and to operate under charter to the New York, New Haven & Hartford Railroad.

MILLER Transportation Company of Philadelphia is making their second conversion of a Brockway truck to a Cummins J-T-6 turbocharged diesel sold by Cummins of Philadelphia.

ONE of the new style 142 series International Harvester TD 14 dozers has been purchased from Ehrbar of Poughkeepsie, N. Y., by Nielsen Construction Company of Warwick, N. Y.

A 58 FT twin-screw yacht is being repowered at Ocean City, N. J., for a prominent yachtsman. The new engines are Cummins H R M 600 rated 165 hp each at 1800 rpm. They are equipped with Snow-Nabstedt reverse gears with 1:1 ratio.

JOSEPH PERACILO & Sons of Cold Spring, New York, and Anthony Costanzi of Kingston have each purchased a diesel driven Lorain ¾ yd Dixie backhoe for trenching and general backhoe work in their contracting enterprises. Ehrbar's Poughkeepsie branch made the sale.

JOHN McLEAN & Sons yard at Mahone Bay, N. S. has completed the Cummins diesel driven Lenarfish, 59 ft 10 in. long by 16 ft beam and 8 ft draft, for Leonard Brothers of North Sydney, N.S.

GLADDING-HEARN of Somerset, Mass. has finished the 43½ ft tug Dave White for the Bay State Dredging and Contracting Company. The propulsion engine is a General Motors 6-71, installed under a removable hatch so it can be lifted out for overhauling without any structural changes in the boat.

A 150 HP Caterpillar diesel will be installed in a 40 ft welded steel dredge tender for use in Dutch Guiana. Gladding-Hearn are also the builders of this boat.

AN INTERESTING machinery installation is a pair of G-M twin 6-71 diesels being installed in the 71 ft high-speed fishing and cruising boat being built at Camden Maine by the Camden Shipbuilding Company. The engines were sold by Hubbs Engine Company of Cambridge, Mass.

THE NEW twin-screw towboat Papa Guy is operating in the fleet of the L. P. Stewart Company, Piney Point, Md. with a pair of 12-cyl. Caterpillar diesels delivering 980 hp. The Alban Tractor Company of Baltimore sold the engines and the Dravo Corporation of Pittsburgh built the 90 ft boat and a pair of 240 ft integrated barges for inland and coastal waterway operation.

ALBAN HAS also sold a D 375 Cat driving a 225 kw generator for emergency service at the Walter Reed Hospital in Washington, D. C.

THE Allan Wood Steel Company of Conshocken, Pa. is taking delivery of four torque converter package power units for locomotive crane conversion to Cummins diesel drive. The engines are HRI 600s sold by Cummins Diesel Engines Inc. in Philadelphia.

C. J. LANGENFELDER operating on construction work connected with the Baltimore Belt Way recently purchased several of the huge Caterpillar D 9 dozers. The horsepower rating of the engine at the flywheel is 286 hp. This machine is over 17 ft long and weighs in operation some 58,725 lbs.

AN INDICATION of the regional demands for heavy mechanized equipment is revealed in the sale of 18 D9 Caterpillar dozers during the past year by Alban Tractor Company of Baltimore.

THE WASHINGTON National Airport has recently installed a Caterpillar 350 kw diesel-electric set for standby power. The vendor was Alban Tractor Company.

AL DAVIS at West Hurley, N. Y. and Frank Anderson at Lake Katrine, N. Y. have also purchased TD 9 International Harvester tractors with Drott loaders sold by Ehrbar of Peekskill.

IN CONNECTION with a five-year construction project, Petit Brothers of Sufferin, N. Y. added an I-H TD 18 to their mechanized construction equipment. This new unit is one of the TD 182 series.

THE NAVAL Research Laboratory at Chesapeake Beach, Md. has installed a new 250 kw generator set with a Cat D397 diesel sold by Albans Tractor of Baltimore.

M. ROSENBLATT & Sons of New York have been commissioned by the Navy to design two tugs of 1500 hp each, one to be driven by diesel-electric power and the other to be equipped with gears and controllable pitch propellers.

THE NAVY has awarded a contract to the New York Shipbuilding Corporation and another to the Ingalls yard in Pascagoula for two conventional diesel-electric submarines. For security reasons particulars are withheld.

THE NORFOLK and Western Railroad has ordered a twin screw diesel tug to be built by the Jakobson Shipyard of Oyster Bay. At the time of writing particulars were not available.

A TANK FARM is being set up at Riverhead, Long Island to receive fuel from tankers via a pipe line extending 6900 ft out to sea. Tankers will deliver

The *New* 82-V vacuum pumping unit "with dry sight feed," an exclusive Manzel development will end your liquid sight feed problems. Install them on any existing Manzel lubricator. *Now* — more accurate than ever . . . it will pay you to get complete detailed information on this dependable, field-proven Manzel unit.

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cargo with their own pumps into two tanks ashore of 250,000 bbl. capacity. The oil will be distributed on land by a pumping system powered by a Caterpillar D 315 while another engine of the same model will drive a 40 kw generator set for plant light and power. Incidentally the equipment to bring the concrete encased pipe line to the waters edge was also Caterpillar.

THE LARGEST plastic sailer ever built is the 16 ton, 40 ft sailing auxiliary owned by Gene Henry Firoux and powered by a Mercedez-Benz diesel Model OM-36 rated 34 hp. The boat is to leave soon for the South Seas in connection with a study of ocean winds and waves.

JACK GILL of Hurley, N. Y., a sweet corn grower just purchased a Caterpillar D4 from W. F. Havelind, Inc. of Highland, N. Y. for tillage and to drive an irrigation pump with the power take-off.

E. BOSCHERT & Sons of Marlboro, N. Y. just bought a Cat D2 with tool bar and dozer blade for tillage, general service and to pull a sprayer for fruit trees.

M. G. HURD & Sons are big farm operators at Clintondale, N. Y. They recently purchased a Caterpillar D4 with a dozer blade for use in burying stone walls, digging irrigation ponds, land reclaiming and powering irrigation pumps. The vendors were W. F. Havelind, Inc. of Highland, N. Y.

Chart For Coupling Selection

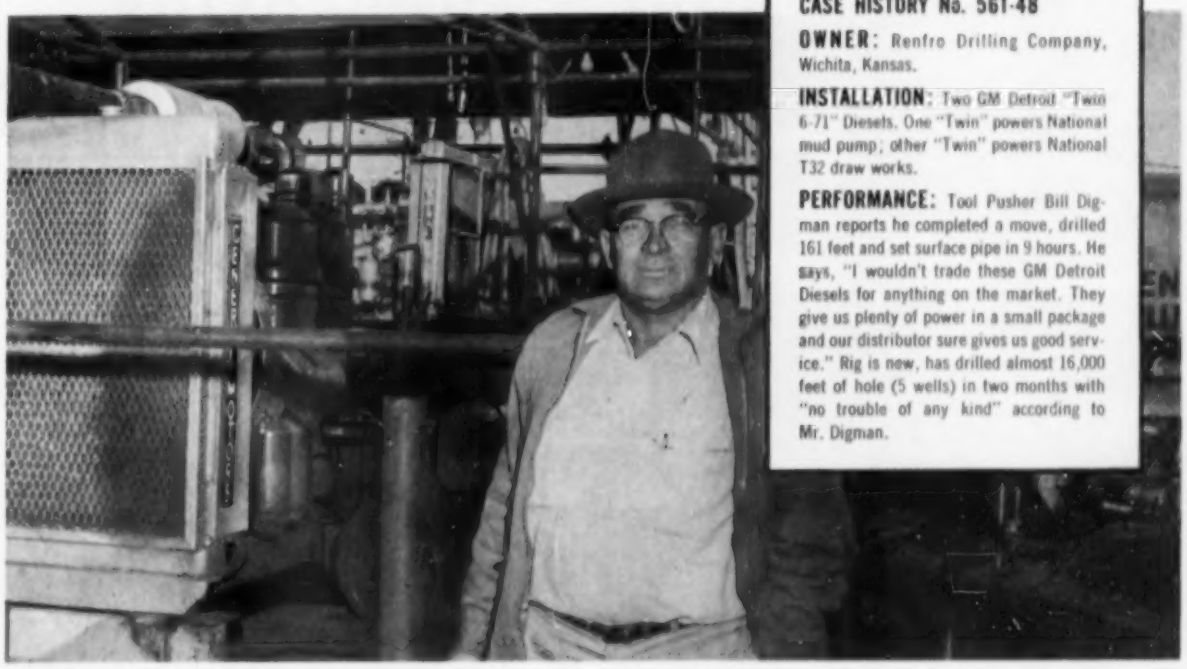
A new coupling Selection Chart, developed by Morse Chain Company, Ithaca, New York reduces the time necessary to select a flexible coupling to a matter of minutes. The chart, 22 in.x17 in., may be hung on the wall, inserted under a glass desk top or folded for easy filing. The first step in selecting a coupling is determining the smallest size that will be large enough to accommodate the shafts to be connected. To speed up this step, Morse has condensed the critical specifications of their three distinct types of couplings—Roller Chain, Morflex and Silent Chain.

The main horizontal headings of the chart are the three coupling types and sizes with the bore diameter range of all coupling halves. N.E.M.A. electric motor frame numbers, both old and new, are listed in the extreme left hand column in sequence according to shaft size. The next column lists given shaft sizes ranging from ¼ in. to 4-½ in. This Shaft S e column is repeated as the extreme r ht-hand column for convenience of the ser. Shaft sizes not directly opposite a motor frame number represent additional coupling bore sizes available to accommodate shafting of driven equipment.

Under each separate coupling heading, the bore diameter range is indicated by means of a color code as a cross reference with the appropriate shaft size. Solid blue, solid yellow and blue cross-hatched rectangles are used. The solid blue rectangle indicates stock coupling halves complete with finished bores, keyway and setscrew. The light colored or yellow rectangles indicate minimum plain bores and all listed bored diameters which may be obtained by reboring to size. The third type of designation, the blue cross-hatched rectangle, applies specifically to the Morflex Couplings column. This is to denote a collar type flange which may be rebored to larger diameters than can be obtained in the standard oval type flanges.

The Morse Flexible Coupling Selection Chart is a valuable time saver. Copies may be obtained from any Morse Distributor or by writing directly to the Morse Chain Company, Industrial Sales Division, Ithaca, New York. (ITS NEW)

Makes Move—Drills 161 Feet—Sets Surface
ALL IN 9 HOURS



GM DETROIT DIESEL
CASE HISTORY No. 561-48

OWNER: Renfro Drilling Company, Wichita, Kansas.

INSTALLATION: Two GM Detroit "Twin 6-71" Diesels. One "Twin" powers National mud pump; other "Twin" powers National T32 draw works.

PERFORMANCE: Tool Pusher Bill Digman reports he completed a move, drilled 161 feet and set surface pipe in 9 hours. He says, "I wouldn't trade these GM Detroit Diesels for anything on the market. They give us plenty of power in a small package and our distributor sure gives us good service." Rig is now, has drilled almost 16,000 feet of hole (5 wells) in two months with "no trouble of any kind" according to Mr. Digman.

JIMMY DIESEL'S MAINTENANCE TIPS

Your GM Detroit Diesel is built to stay on the job day in and day out for a lifetime of hard work. You'll get even better service from your engine if you have your GM Detroit Diesel distributor or dealer set up a preventive maintenance program for you. Call him today, and remember—Preventive Maintenance Doesn't Cost, It Pays.

YOU SPEND more time drilling—less time moving—with a General Motors Detroit Diesel on your rig because this 2-cycle Diesel packs more power in a smaller, lighter engine that lets you make faster, easier moves usually without special road permits.

And with a GM Detroit Diesel you make hole faster, too. For its snappy 2-cycle operation with power on every piston downstroke gives you action *right now* when the driller hits the throttle. That means faster round trips, more time on bottom, quicker hole completion wherever you're drilling.

Your local GM Detroit Diesel distributor or dealer can give you full details on GM Detroit Diesel power for your drilling rigs—or for servicing or fracturing units. See him today or write direct for more information.

Single Engines . . . 50 to 300 H.P. *Multiple Units . . . Up to 855 H.P.*

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Inland River Reports

By A. D. Burroughs

THE SCRAMBLE continues for the new power king on inland rivers with the new vessel ordered by Upper Mississippi Towing Company from St. Louis Ship as a main current contender. The widest boat yet ordered from this yard, measurements will be 156 x 50 x 11 ft, with power for the yet un-named vessel to be provided by the three Fairbanks-Morse 10 cyl. OP engines, Model 38D8⅛, rated at 1600 each, totaling 4800 hp.

DESPITE the high water conditions, reported in many inland river spots as the highest for this time of year since 1888, new boat construction, new boat orders, and launchings show the increase of activity evident since the end of the steel strike.

AN ORDER for a 3,000 hp towboat has been placed with Nashville Bridge Co., by the new Mid-America Transportation Co., Uniontown, Ky. with power to be supplied by two 8 cyl. 498 GM (Cleveland) engines rated at 1500 hp each. Yet un-named, delivery is scheduled for early 1957.

THE *Yazoo*, owned by Magnolia Towing Co., was launched in September with the honor of being the largest diesel boat yet built at Vicksburg. Measuring 90 x 30 ft, three Caterpillar engines rated at 650 hp each provide the power.

ANOTHER recent St. Louis Ship production, the *Carcrosse*, gained its share of the limelight as the biggest and most powerful towboat in the Cargo Carriers fleet, featuring Cooper-Bessemer engines developing the 2400 hp.

BETTY MORAN, the 124 ft towboat recently completed at St. Louis Ship for Moran Towing and Transportation Co., is in action towing oil from Texas to points eastward as far as Pittsburgh. A part of the planned $1,500,000 expansion program for the Moran Company, this $500,000 vessel is powered by two GM 12-567 engines each rated at 1080 hp at 750 rpm.

THE NEW *Joey*, 60 ft towboat for the new towboat management company, Bayou Marine Management, Inc., New Orleans, received favorable comment on its maiden trip into Corpus Christi. Designed by Oliver Bryant, president of Bryant Boats, Inc., owned by Joseph Leonard, Jr., the 800 hp is supplied by two Allis-Chalmers engines with Western hydraulic reduction gears.

THIS new BMMI Company has two more towboats under construction with the 1200 hp towboat *Little Eagle II* under construction by Jack Egle, Golden Meadow, La. to be equipped with two super-charged Superior engines. The 70 ft, 1100 hp towboat under construction by Nolte Theriot, also at Golden Meadow, will be equipped with Allis-Chalmers engines.

REPORTS on small-boat diesel-equipped efficiency comes from the new *Charles J. Feeney*, the 54 x 21 ft towboat built by Missouri Valley Steel now in service for its owner, Pioneer Sand Co., St. Joseph, Mo. Using the power developed from two 150 hp Caterpillar D342 engines, this boat pushes the two barge tow rated at 45 tons empty, 345 tons loaded marking upstream time at 6½ mph, downstream time at 10 mph.

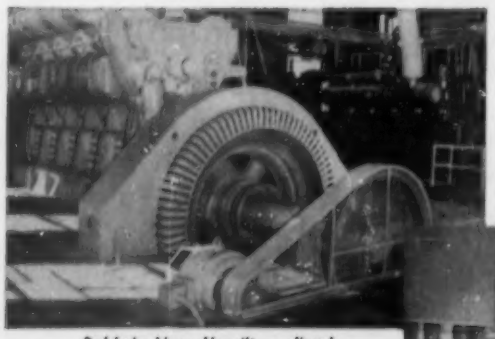
THREE Cummins engines, each rated at 600 hp will supply the propulsion power for the new 72 x 24 x 8 ft triple screw *Etta Marie*, due for delivery from Greenville (Miss.) Manufacturing and Machine Works yet this year for Port City Towing Co.

THE NEW sister boat to the *Valley*

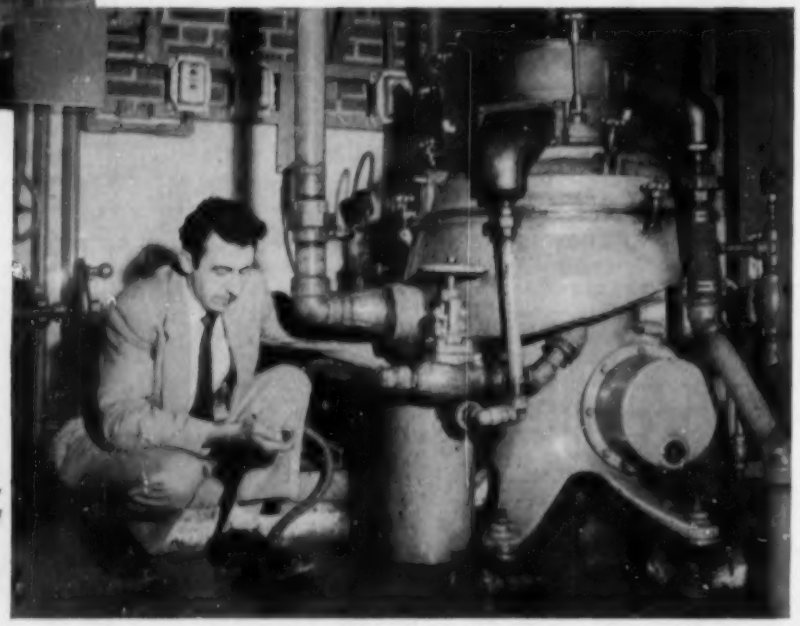
DE LAVAL AC-VO CENTRIFUGE SAVES EDMUNDSTON $30,638 IN ONE YEAR!

The City of Edmundston power plant in New Brunswick adds another story of tremendous savings through the use of residual fuel—purified by De Laval.

With #2 diesel fuel costing 15½¢, and residual 9¼¢ per gallon... there is a gross savings of 6¼¢ per gallon when residual fuel is used. Mr. L. Long, Electrical Superintendent says: "A total of 490,216 gallons of #6 fuel was burned from May 1, 1955 to May 1, 1956. *Gross savings amounted to $30,638.50.*



Baldwin-Lima-Hamilton diesel engine at City of Edmundston power plant in New Brunswick.



De Laval AC-VO "Nozzle-Matic" Continuous Purifier at City of Edmundston plant.

Mr. Long says "the De Laval AC-VO removed some 5,280 gallons of sludge. The engine operated 4912 hrs. on heavy fuel. A thorough inspection showed that fuel injection equipment, bearings, gears, etc., were in excellent condition."

Get tremendous savings with low-cost heavy fuel oil—*purified by De Laval!* Write for details... today!

DE LAVAL SEPARATOR COMPANY

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 201 E. Millbrae Ave., Millbrae, Calif.

Transporter and *A. D. Haynes II*, now on order with Dravo by MVBL will also be equipped with a matched pair of Nordberg Supairthermal marine engines.

A KAHLENBERG Bros Co. Model E 6-cyl. engine rated at 700 hp at 350 rpm supplies the power for the new towboat *Sandra Marie* recently christened at Christy Corp. shipyard for S and S Marine Towing Co., Joliet, Ill.

THE ALL-STEEL 72 x 24 ft towboat near completion at McMillian Welding and Machine Works, Greenville, Miss., will go into towing service for the KGW Towing Company equipped with two 500 hp Caterpillar engines.

A NEW addition to the fleet owned by Capt. Edward F. Smith will be the new 72 x 22 ft towboat powered by two Superior engines totalling 580 hp. This craft will be transported overland via 32-wheel trailer from Sewickley, Pa., where it is under construction to Leesdale, Pa., where it will be launched.

WHILE in the Pittsburgh area we caught a good picture of the Virginia in the swollen waters with two derrickboats and an equipment barge, receiving good response from the Buda engine rated at 160 hp. This 33-year-old towboat is owned by Dravo, built at Dravo in 1923.

CINDY JO, new towboat completed at Calumet Shipyard and Dry Dock Co., (Chicago), delivered in September to Rose Barge Lines (Marseilles) is another proud addition of diesels, modern luxury and efficiency featuring the two Model 40 Superior engines, developing 800 hp each. Two Caterpillar Model D315 engines provide the auxiliary power.

ENTHUSIASTIC reports have been coming in on the Dravo-built *Raymond E. Salvati*, now in service in the coal trade for the owners Island Creek Fuel and Transportation Co. Measuring 148 x 34.7 x 10 ft-6 in., modern features include radar, ship to shore phone, plus the 2560 hp developed from the twin pair of Enterprise engines.

Expansion Joints Catalog

A new 72-page catalog just published by Zallea Brothers, Wilmington, Del. covers the design, manufacture and application of the company's line of packless corrugated expansion joints, including three new types. Designated as Catalog 56, it introduces Zallea's new self equalizing, duo equalizing and high pressure toroidal expansion joints. It also gives essential data on the company's 9 other types of joints: non equalizing, universal, self equalizing universal, non equalizing universal, modified universal, flexible connectors, hinged and gimbal, pressure balanced and pressure balanced universal expansion joints.

The catalog is illustrated with more than 150 photographs, line drawings and schematic diagrams. It describes how the various Zallea expansion joints can be used to absorb axial movement, lateral deflection and angular rotation in process piping systems. Tables and charts give complete engineering specifications.

A selection chart tells how to choose the correct expansion joint for a given set of conditions. Another table presents latest thermal expansion values and recommended maximum and minimum temperatures for different piping materials, recently adopted by the Expansion Joint Manufacturers Assn.

Copies of Zallea Catalog 56 are available to engineers, contractors, consultants and purchasing agents. Requests should be made on company or professional letterhead to Zallea Brothers, 895 Locust St., Wilmington 99, Del.

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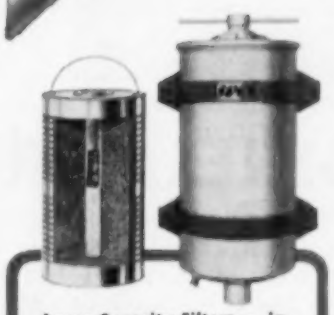
Can and Does Chew Up Diesel Engines



Large-Capacity Filters — including the WF-750 Bar-type cover handle for heavy duty applications. Eliminates troublesome cover bolts, speeds cartridge changing.

Sock and Can-type Cartridges for Fuel and Lube Oil filtration.

Your choice of many outstanding Filtrants engineered to give you prescription-type Cartridges for your particular operating conditions.

Peak dirt retention capacity built into every Filtrant—giving you longer intervals between Cartridge changes and higher filter efficiency throughout the life of every Cartridge.

WIX makes a "big production" out of a little destruction . . . but that "little destruction" can chew up *your* dollars *fast!*

Contamination in fuel and lubricating oil is a continuing problem — affecting construction equipment, trucks and buses, marine, railroad and stationary engines. The service life and performance pattern of your Diesel engines is directly related to the cleanliness of fuel and lube oil.

WIX Oil Filter Cartridges are the product of objective research and engineering. They do a superlative job of keeping oil clean — give you a solid form of insurance against excessive downtime, maintenance cost and engine wear.

Write today for the complete WIX Catalog of HEVI-DUTY Cartridges for Fuel or Lubricating Oils . . . or for the assistance of WIX Filtration Engineers.

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Michigan–Ohio News

By **Jim Brown**

PENINSULAR Diesel, GM Detroit Diesel distributors in Detroit, has been appointed a servicing depot for Daffin Manufacturing Co., Lancaster, Pennsylvania, manufacturers of the Daffin portable feed mill, and are currently rebuilding one of the Daffin mills which was wrecked in an accident. Daffin feed mills all are powered with GM Detroit Diesel model 4051C engines.

SARGENT Construction Company of Saginaw, Michigan recently purchased from Michigan Tractor and Machinery Company of Detroit three DW21 Caterpillar Low-Bowl Scrapers for use on a road re-location project near Charlotte, Michigan.

CUMMINS Diesel Michigan Inc. is currently having a new home constructed at 3760 Wyoming Avenue (just below Michigan Ave.,) in Detroit. The new building will be one of the largest and finest occupied by any Cummins Sales and Service outlet in the world, and it is located right in the center of the trucking industry of this area.

THE CARY and Zeigler Company of Burton, Ohio recently purchased an American W200C excavator from the Gibson Stewart Company of Cleveland, Ohio. It is powered by a GM Detroit Diesel 3057C engine.

CUMMINS Diesel Michigan Inc. has appointed the White Motor Company factory branch at Detroit as an authorized service dealer. White Motor Company is selling many diesel tractors in this area, all with Cummins power.

GEORGE SOUTER and Sons Company of Detroit are in the unique business of manufacturing road and driveway surfacing material from broken concrete. They bust up the old concrete in a jaw crusher, and recently purchased a new GM Detroit Diesel 6-71 engine to replace a used one they started out with. Bought it from Peninsular Diesel of Detroit.

REDFORD Excavating Contractors, Redford Township (Detroit) Michigan and right up the street from yours truly, has a new TD-6 International Harvester Tractor they recently purchased from Wolverine Tractor and Equipment Company of Detroit and Grand Rapids.

STANLEY Gravel Company of Lennox, Michigan has added another Link-Belt Speeder shovel from Michigan Tractor and Machinery Company to others they had, making a total of three in use, all with Caterpillar diesel engines.

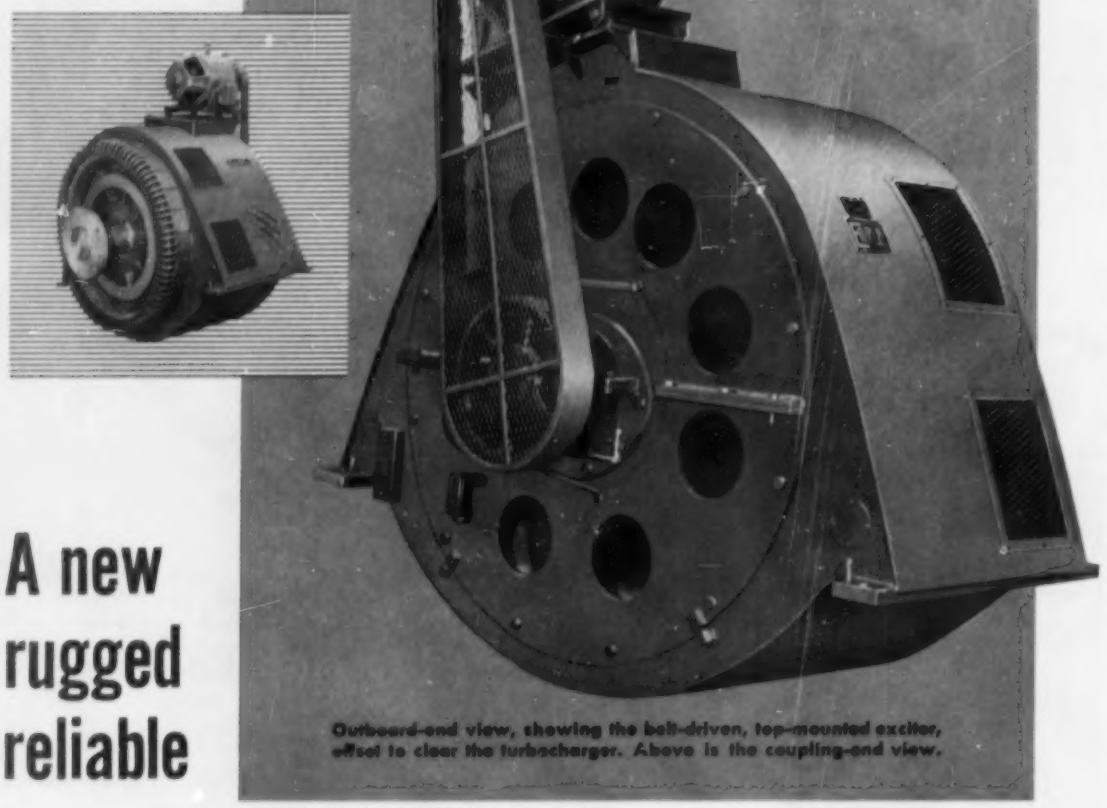
ANOTHER TD-6 customer of Wolverine Tractor and Equipment Company is Luigi Panetti of Hazel Park, Michigan.

TOM ROBINSON of Jackson, Michigan recently purchased a Bucyrus-Erie 22B Drag Shovel powered with a GM Detroit Deisel engine.

TO HELP on their sewer line contracts Vermeersch Construction Company of Lansing, Michigan, is using a new Frank G. Hough model HO diesel Payloader purchased from Wolverine Tractor Co.

IN TOLEDO, Ohio, Diesel Truck and Equipment Company, local Diamond T Truck Distributor, has been added to the list of Cummins Authorized Service Dealers.

CUMMINS Diesel Michigan Inc. says that new impetus has been given their business by the complete new series of tractors being built by Reo Motors of Lansing, to obtain high performance from the Cummins JT6B Turbodiesels.



Outboard-end view, showing the belt-driven, top-mounted exciter, offset to clear the turbocharger. Above is the coupling-end view.

A new rugged reliable

ELLIOTT *High-Speed* A-C GENERATOR

Light weight, dependability and ease of maintenance are outstanding characteristics of the new Elliott High-Speed Synchronous Generators. The unit shown above is rated at 1875-kva, 1500-kw, 720-rpm. It is a single bearing, coupled type, with top-mounted exciter.

Elliott FABRISTEEL construction assures maximum strength and rigidity with minimum weight. Maintenance is simplified by split construction of the brackets, large holes for access to collector-ring brushes, removable split-sleeve type bearings and removable screen covers. The bracket is of rigid plate construction, vibration-free yet light in weight, a desirable feature that is appreciated during maintenance operations. The large holes also permit unrestricted flow of ventilating air into the machine. Elliott's extensive experience with high-speed electrical machines is reflected in the design and construction of the rotating parts.

In addition to the type of machine illustrated above, Elliott makes high-speed a-c generators in all ratings and in a large variety of frame enclosures and bearing arrangements.

For complete information, consult your nearest Elliott field engineer, or write Elliott Company, Ridgway, Pennsylvania.

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS
CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

ELLIOTT Company

R6-21

PENINSULAR Diesel of Detroit is fabricating and preparing a 275 kw generator set for Storer Broadcasting Company—operators of WJBK-TV, Detroit—for use as a standby for their studio building. Set will be based on a Delco alternator and a 12208 Twin 6-71 GM Detroit Diesel engine. Come to think of it—studio buildings are as much in need of standby protection as broadcasting stations.

LIKE MANY other International Harvester Tractor owners in this vicinity, Angus A. McIntyre of Port Huron, Michigan, has his new TD-9 outfitted with a Drott four-in-one attachment with which he can do almost everything but play pinochle.

WOLVERINE Tractor Company also reports selling an International Harvester TD-14 Tractor to Somerville Construction Company of Ada, Michigan and a TD-9 with a hydraulic 'Dozer to the city of Marysville, Michigan.

LOUIS PADNOS Iron and Metal Company of Holland, Michigan recently had Peninsular Diesel re-power his Michigan crane with a GM diesel. Peninsular has a way of driving the magnet-charging generator right off the timing-gear train at the back of the engine; it's a space-saver, and works well.

DOWN AT TOLEDO, Ohio a Toth Transportation work boat was recently tied up at the Hanson Welding Company's dock to receive two new Cummins HRI engines to drive the 60 kw direct current generators which had been driven long and well by two older Cummins engines. After having been abandoned once in a storm, this boat was saved by these generator sets which continued to power the bilge pumps and kept her afloat several days until the crew returned.

FAR UNDER Detroit city streets, the International Salt Company is using a F. G. Hough model HO Diesel Payloader, purchased from Wolverine Tractor Company this year, to load salt in one of its huge mines.

DEAN MONAGIN of Oak Park, Michigan, recently took delivery of a Marion 43M Power Shovel from the Marens-Feder Company, Marion Distributors in Detroit, powered by a 4-71 GM Detroit Diesel.

IN BAY CITY, Michigan, Superior Transport Company has converted seven of their Mack trucks to Cummins diesels.

THE UNION Construction Company of Manchester, Michigan, recently put a new Caterpillar-powered Bucyrus-Erie 15B Shovel to work.

OHIO Machinery Company of Cleveland recently sold to H. B. Layne Company of Springfield, Ohio, an L-26 Thew Shovel, powered by a GM Detroit Diesel 3055C engine.

IN DETROIT, Cummins Diesel Michigan Inc. promoted Orve Rodeheaver to Service Manager, according to I. M. Berry, General Service Manager of that state-wide organization. Mr. Berry said of Orve: "He has a wealth of experience and the right bed-side manner to help sick vehicles get back on the road fast."

MAYNARD W. Cole, a former O.E.M. Sales Engineer for Detroit Diesel Engine Division of General Motors, is now Sales Engineer for the western half of Michigan for Peninsular Diesel of Detroit. While with GM, Maynard had at different times covered nine different states, and brings to Peninsular Diesel a wealth of experience in the application of GM Diesel engines.

Detroit Diesel Works Manager

The appointment of Eugene K. Kelly as works manager of the Detroit Diesel Engine Division of General Motors has been announced by Clyde W. Truxell, general manager. In his new post, Mr. Kelly succeeds Mr. Truxell whose appointment as general manager was also recently announced. Prior to his present appointment, Mr. Kelly served as master mechanic of aircraft engine operations at GM's Allison Division in Indianapolis, Indiana. He comes to Detroit Diesel with an extensive manufacturing and tooling background.

Mr. Kelly's first association with the GM Detroit Diesel engine was in 1940 when he joined the then Yellow Truck and Coach Company in Pontiac, Michigan as a product engineer. He later served GM's Pontiac Motor Division as process engineer and tooling supervisor. On these assignments and also as a member of General Motors' central office manufacturing staff where he served as engineering assistant to the director, he had much to do with the development of specialized machines and tools now extensively used in GM plants throughout the country. Mr. Kelly was born in Denver, Colorado and was graduated from Northwestern University in 1940 as an industrial engineer.

Metal plating, such as Porus-Krome is a tried and proven way to reduce friction and cut down wear and tear on a diesel engine. Great pity nothing of the sort has been found for the human element around the machinery.

Your assurance of EFFECTIVE FILTRATION

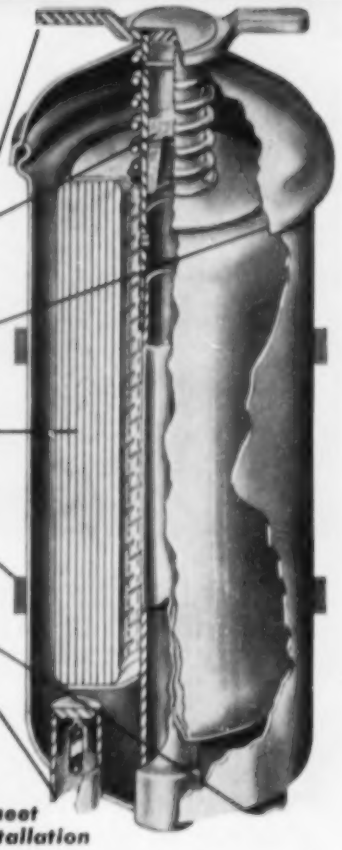
ENGINE LIFE

LUBE AND FUEL OIL FILTER CASES

Guarantee THE ULTIMATE IN OIL CONDITIONING!

Check THESE ENGINEERING FEATURES:

- Hand control for quick servicing. No wrenches required.
- Exclusive dual purpose by-pass design insures full oil pressure for maximum engine protection and longer element life.
- Functional "O" ring seal—The greater the pressure, the greater the seal. Eliminates constant gasket replacement.
- Elements are designed to give a maximum of filtration, accomplished by the use of perfected filtering media in relation to service requirements.
- Sturdy clamp-type mounting for safe installation under all conditions.
- Drain is located at the bottom of oil sump.
- Inlet at bottom for ease and safety of installation. Inlet check valve prevents drainback and undesirable turbulence.



Over-all dimensions meet truck or industrial installation requirements.

FULL FLOW FILTRATION

Oil conditioning and full flow protection to all precision working parts of the engine are incorporated in the same unit. Cases are designed so that new elements may be replaced in a matter of moments.

A COMPLETE LINE OF FILTERS AND REPLACEMENT ELEMENTS

ENGINE LIFE PRODUCTS CORPORATION

EL MONTE, CALIFORNIA

ENGINEERED FILTRATION SERVICE

INDUSTRIAL AUTOMOTIVE MARINE & AGRICULTURAL

Mid-West Diesel News

By **L. H. Houck**

G. B. MASON, gravel contractor, Springfield, Mo., has put an Allis-Chalmers HD-6-G with high-lift loader in service. Sale was made by Chiles Tractor & Machinery Co., and engine is the new Allis-Chalmers (Buda) diesel.

CUMMINS MISSOURI Diesel Sales Corp., St. Louis, has delivered a 110 hp model HRP-400 Cummins diesel to Charles W. Jones, Poplar Bluff, Mo., where it is being used in a sawmill.

ALONG U. S. 75—Max Francis Trucking Co., Enid, Okla., with a Diamond T tractor with Cummins diesel, pulling a 40 ft tank trailor through Topeka, Kansas.

RISS & CO., Kansas City, common carriers, have their GMC diesel tractors on many highways—Two seen along U. S. 40 in Kansas and a couple more hauling explosives on U. S. 50—in one afternoon.

R. M. (MACK) BROWN, Kaiser, Mo., has placed a Caterpillar D4 in service with 60 in. blade and hydraulic control purchased from Fabick & Co., Jefferson City, Mo.

J. W. GITTHENS, Poplar Bluff, Mo., has a new Allis-Chalmers HD-16 with a twin disc torque converter which is being used on a state road job in southern Missouri. Sale was made by Ryan Equipment Co., Sikeston, Mo.

INDIANA EQUIPMENT CO., Indianapolis, distributor for International Harvester, Drott, Hough, Galion and American Hoist, has opened its third branch store and shop at South Bend. Other branch is located at Fort Wayne.

CAUGHT TWO Mack six-wheelers consigned to Seattle distributor at St. Louis. These two units are of the Great Western group designed for logging and were powered with Mack's Thermodyne turbocharged diesels with temperature controlled shutters on the radiator.

KANSAS CITY Public Service Co., which operates several hundred buses powered with GMC Series 71 diesels, has been granted permission by the PSC at Jefferson City, Mo., to borrow $304,000 to help pay for 18 new diesel buses. The balance will be supplied from its reserves.

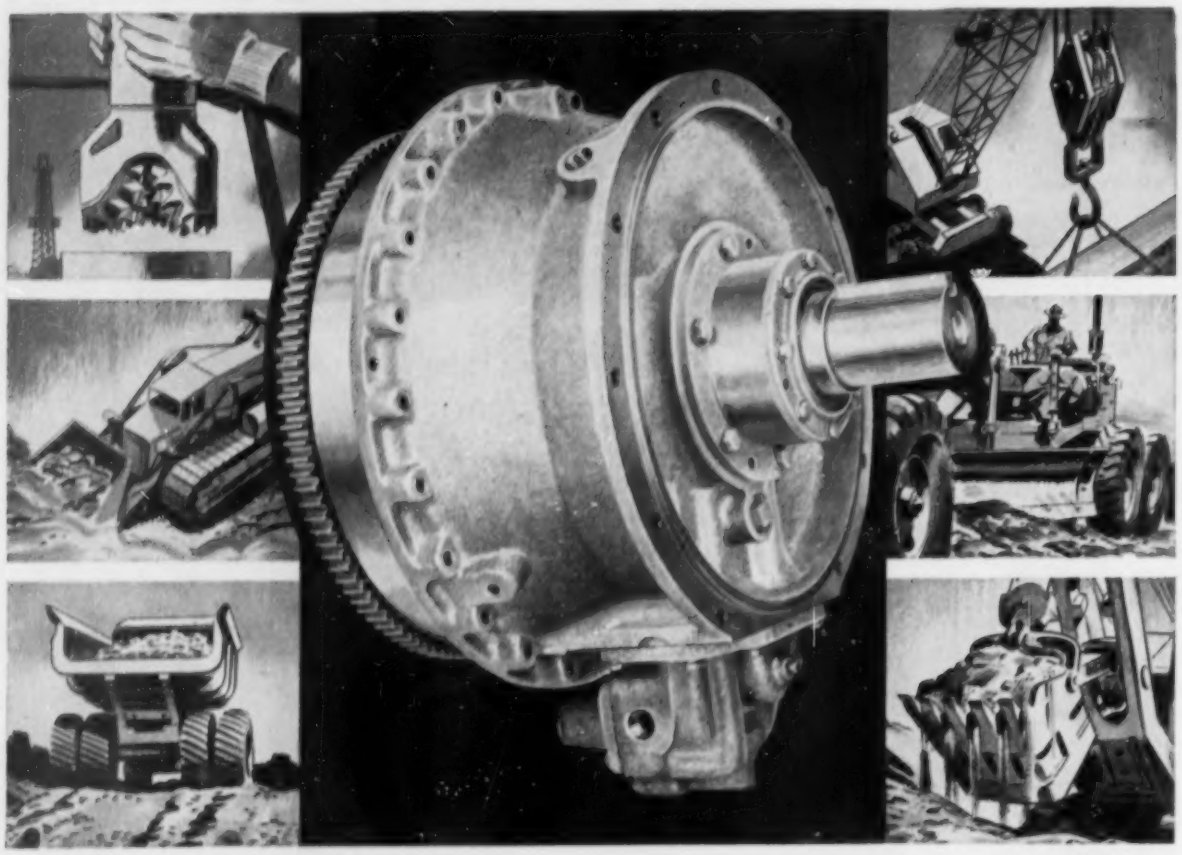
ILLINOIS - PACIFIC Trucking Co., Chicago to the coast, is using Mack Thermodyne diesel tractors on most of its high-cube trailers.

CHILES TRACTOR & Machinery Co., Springfield, Mo., has delivered an Allis-Chalmers model 45 diesel motor grader to the James River Special Road District, Galena, Mo.

U. S. 40 will soon have 18 miles of new paving and grading immediately west of Topeka, Kansas, and the job represents a cross section of diesel usage. Some six contractors are using Euclids with GMC diesels, cranes with Hercules diesels, Caterpillar is well represented as is Allis-Chalmers and LeTourneau Westinghouse, all with diesel equipment. Lorain and Koehring shovels, draglines and cranes are also equipped with diesels.

ANDY SCHULLER, Kearney, Neb., has bought a 110 hp model HRCI-400 Cummins diesel from Cummins Mid-West at Omaha, for use in an irrigation application.

EVANS & HOWARD Sewer Pipe Co., St. Louis, has purchased an Allis-Chalmers HD-6-G to add to its fleet of clay loaders at its mine. Ryan Equipment Co., St. Louis, made the sale.



Versatile is the word for the Torqmatic 500

NAME the gasoline- or Diesel-powered equipment you buy or build in the 150 to 350 horsepower range and it's a sure bet that it's available—or will be soon—with the Series 500 TORQMATIC, *the world's most versatile torque converter.*

Scores of manufacturers—making such varied equipment as cranes, shovels, drilling rigs, log loaders, ditchers, industrial locomotives, scrapers, graders and off-highway trucks—specify the TORQMATIC 500 in the equipment they build, and with good reason.

In one standard housing it gives them a choice of 4 ranges, 7 torque ratios—*and* permits operators to standardize on *one* type of converter for *all* their equipment within the horsepower range.

In many applications it permits the use of lower horsepower engines with no reduction in *working* power because the TORQMATIC 500 multiplies engine torque anywhere from 250% to 360%—*and* means equipment owners will cut operating costs and get more work done per shift.

For full details on the Series 500 TORQMATIC Converter in your equipment write to:

Allison Division of General Motors
Box 894D, Indianapolis 6, Indiana

GM TORQMATIC *Allison* TORQMATIC DRIVES

NAVAJO FREIGHT Lines, are using Cummins-powered White tractors on its U. S. 40 run. White Freightliners use the turbodiesel, JT-6-B.

MOLAND BROS. Trucking Co., Duluth, Minn., recently added 30 new diesel International DTC-405 Roadliners in a $625,000 modernization program.

SILVERFLEET EXPRESS, Louisville, Ky., has purchased 40 White 9000 TD tractors powered with 175 hp Cummins Turbodiesels.

JONES MOTOR CO., a common carrier operation based at Spring City, Pa., has converted its fleet of 300 to 80 per cent diesel operation. Most recent additions were 18 H63T and four B61T Mack Thermodyne diesels. Recent checks show 7.5 mpg while pulling maximum legal loads through Penn's hills and metropolitan traffic. President R. C. Jones, Jr., said the fleet would eventually be 100 per cent Mack diesel.

EGERER-GALLOWAY, Milwaukee, drilling operators and contractors, have repowered a Bucyrus-Erie 28-L spudder with 110 hp model HRCIP Cummins diesel.

Oil and Gas Power Meeting

Now is the time to start planning for exhibit space at the 1957 convention of the Oil and Gas Power Division of ASME at the Kentucky Hotel in Louisville, Kentucky. Ray Schakel is Exhibits Chairman for this meeting, which will be held from May 20 through 23.

The sale of booth space has been going on since mid-August, so space reservations should be sent in right away to insure your getting a good exhibit booth location. The 1956 convention in New Orleans was a big success, with all booth space sold out and a fine attendance, so choice exhibit spaces will be reserved early for the 1957 meeting.

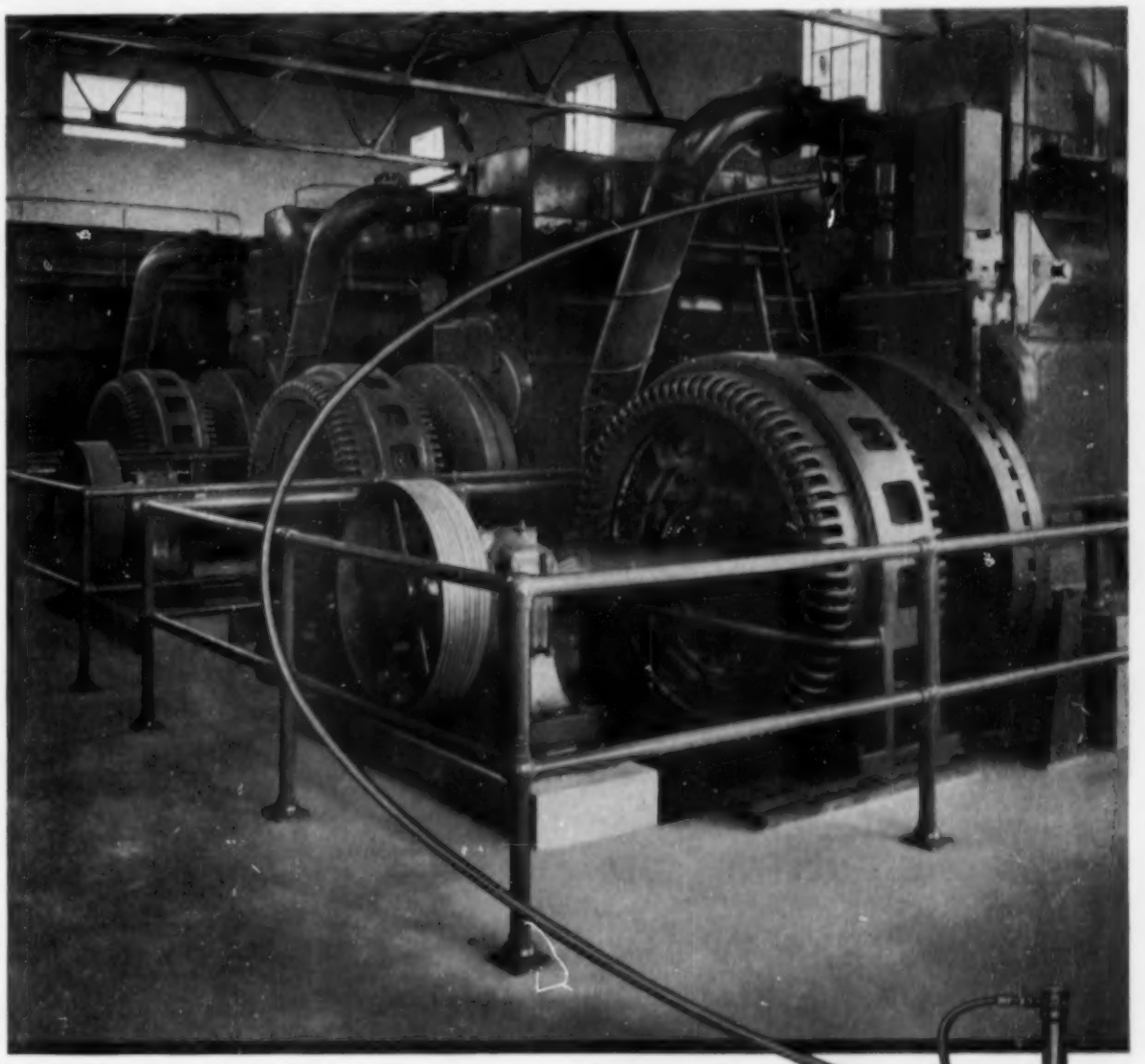
For further information regarding exhibits, contact Ray Schakel at the Diamond Chain Co., 407 Kentucky Ave., Indianapolis, Indiana.

Industrial Hose

Availability of industrial Teflon Hose with detachable, reusable fittings has been announced by Aeroquip Corporation, Jackson, Michigan. The hose is proposed for applications where unusual exposure to wide temperature ranges and injurious chemical action is encountered. Teflon, a new substance technically known as tetrafluoroethylene, is practically inert to most chemical action. It is expected that the new Teflon Hose will be used in the atomic energy and chemical industries. Other general applications include steam lines, hot asphalt lines, and other installations with fluid temperatures in the -100° F. to plus 500° F. zone.

The detachable, reusable fitting available with Aeroquip Teflon Hose offers many advantages. It is leakproof even after aging of hose, may be assembled easily with simple hand tools, may be reused many times. Male pipe and J.I.C. swivel fittings are available for the Teflon program. Further information regarding Teflon Hose may be obtained from the Industrial Sales Department, Aeroquip Corporation, Jackson, Michigan; Aero-Coupling Corporation, Burbank, California; and Aeroquip (Canada) Ltd.; subsidiaries. (ITS NEW)

NOW AVAILABLE! The Completely new Volume 21 of **DIESEL ENGINE CATALOG.** This giant, fully illustrated reference book containing complete and detailed engine and accessory sections is bigger, better than ever before. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company order forms to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, California.



NO STUCK RINGS!

Stop the formation of varnish, sludge and carbon in your Diesels and *keep it stopped* with Sinclair RUBILENE®, the high viscosity index oils proved by over 35 years in industrial Diesel applications. RUBILENE earns its reputation by its performance under continuous operation and heavier loads. It fights deposits and gives better protection to cylinders, pistons, rings and other vital moving parts. Your Diesel stays on the job longer . . . service time is cut 'way 'way down!

Let RUBILENE help solve your lubrication problems. Regardless of the make or age of your Diesel, where a high VI oil is needed, there's a member of Sinclair's RUBILENE or RUBILENE HD family that meets your requirements exactly. Call your local Sinclair Representative for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Ave., New York 20, N. Y. *There's no obligation.*

SINCLAIR RUBILENE OILS

West Coast News

By James Joseph

RUSHING to completion along California's famed Ridge Route (Highway 99) is a brake-check parking lot—plus an escape ramp for runaway rigs. Some 1200 rigs (mostly dieselized) descend the 6-7 per cent grade daily. Six runaway rig deaths since Jan. forced the construction, backed by the California Trucking Associations, Inc.

VANCOUVER Memorial Hospital has installed two new 100 kw generators (powered by Buda 8DA-1290 diesel engines turning at 1200 rpm) as protection against power outages. Sale via Portland's Hamilton Engine Sales, Inc.

OPERATING a Karl F. Jacobsen Construction Co. batch plant near Olympia, Wash., a model 6DA-844 Buda, closed type power unit with Twin Disc clutch operating at 1500 rpm.

GENERAL Construction Co., Portland, Ore., has taken delivery on a 6DAMR-273 Buda marine engine for small tug boat work near Garabaldi, Ore.

TO REPOWER their BU-125 Skagit yarder operating the McKenzie river area, Hale Bros. Logging Co., Springfield, Oregon, has purchased a model 6DAS-844 Buda diesel (280 hp at 2100 rpm), with Western Gear TSD-4 convertor transmission.

FOR KETCHIKAN Pulp Company, Ketchikan, Alaska, a GM 3-71, for company's new steel tug abuilding in Seattle.

TWO Fairbanks-Morse model 38D8-⅛, 6-cylinder, 1200 hp marine diesel engines have gone to San Diego's National Steel & Shipbuilding Co.

AMERICAN Independent Oil Co., San Francisco, has taken delivery of a Fairbanks-Morse 45B4-⅛, 5¼ hp diesel unit.

A BUDA 6DCG-1879 is working a portable gravel plant for Roseburg, Oregon's Beckley and Thomas Co. Diesel drives a 125 kw generator turning at 900 rpm.

REPLACING a gas engine in a Bucyrus-Erie 22-B transit crane for Greshem Sand and Gravel, Greshem, Oregon, is a Buda 6DTS-468 diesel, with Twin Disc clutch.

SOLD to Ott Hardware Co., Santa Barbara, Calif., a Fairbanks-Morse model 49, 4 cylinder, 4½ hp diesel engine.

ADDED to Booth Kelly Lumber Co.'s fleet operating the Mosby Creek (Oregon) area, a B-81 Mack and Autocar, both powered by 6DAT-844 Buda turbocharged engines.

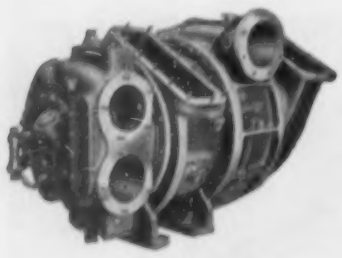
CUMMINS Service & Sales' new, $300,000 Montebello, Calif. branch is scheduled to become operative in October; its manager is James H. Flanagan. Located on eight acres, the building has 18,000 sq ft for shops, engine storage and parts department.

FOR LOGGING the Mt. Hood area, Foreman Bros. Logging Co., Estacada, Ore., has repowered a Washington yarder with a Buda 8DA-1125 diesel, direct connected.

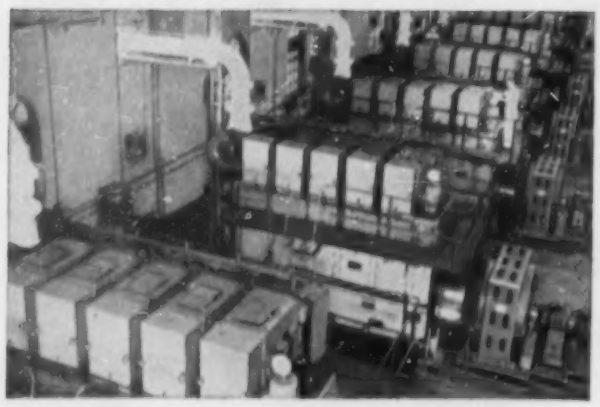
TO P. S. PELL & Co., Ltd., Honolulu, T. H., a Fairbanks-Morse Model 45B3-⅛, 5¼ hp generating set.

FOR TACOMA Yachtsman Reuben Carlson, a GM 6-110 diesel for his new yacht now under construction at Tacoma Boatbuilding Co. Sale via Seattle's Evans Engine and Equipment Co., Inc.

SOLD to Secretaria de Marina, Mexico, a Fairbanks-Morse model 38F5¼, 4-cylinder, 300 hp diesel engine.



'English Electric' chose Napier Turbo-blowers



for these alternator sets

By courtesy N.S.W. Government Tourist Bureau.

which power this city

The seven 'English Electric' 5SRL Diesel alternator sets installed in the civic power station at Newcastle, N.S.W., Australia are each fitted with a Napier TS 300 turbo-blower. The power station supplies the whole of the city's power requirements. Why did 'English Electric' choose *Napier* blowers? Here are three good reasons:

- Napier blowers have *high adiabatic efficiency* resulting in low fuel consumption and maximum power increase.
- Napier blowers are backed by a world-wide service and spares organisation.
- A high standard of workmanship is guaranteed by Napier's long experience in the design and manufacture of aircraft engines and gas turbine machinery.

Napier turbo-blowers are available in seven sizes for engines of 140-5,000 h.p. afloat and ashore. Multiple installations for engines of higher powers. On 4-stroke Diesels they can double the power, on 2-strokes they increase it by over 30%—often at a lower specific fuel consumption. Napier turbo-blowers are currently in service in 69 countries.

NAPIER Turbo-blowers

D. NAPIER AND SON LIMITED • LONDON • W.3 • ENGLAND

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CRC T12

JAKE MANN Logging Co., Swisshome, Ore., has repowered a BU-85 Skagit yarder with a Buda 6DA-844 diesel (215 hp at 2100 rpm).

TO POTLACH Forest Inc., Potlach, Idaho, a new Le Tourneau log stacker powered with a Buda 6DA-844, for firm's decking area.

FOR SWEET HOME, Oregon's Gilbert Logging Co., a 6DAS-844 Buda diesel with deep sump pan for angle operation with Twin Disc torque converter, for repowering Allis Chalmers crawler tractor.

Tractor Shovel Brochure

Structural features of the Allis-Chalmers HD-6G Diesel powered tractor shovel are discussed, and the shovel hydraulic system of this tractor shovel reviewed, in the new two-color, eight-page catalog (MS-1101) now available from the Construction Machinery Division, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Photographs, drawings and charts help convey to readers the HD-6G's story of high output, long life, easy, time-saving servicing and show the features built into the unit for operator comfort and safety. Also included are specifications and listing of interchangeable matched attachments designed and engineered to the HD-6G to increase its versatility and action capabilities. ITS NEW

Mack-Brockway Combination

A transaction has been completed whereby Mack Trucks, Inc., will take over Brockway Motor Co., Inc., and Mack has announced that the Brockway operation of manufacturing heavy-duty over-the-road trucks will be continued in its present form. The agreement awaits only formal approval by Brockway stockholders. P. O. Peterson, Mack president and H. O. King, Brockway president, said that Mack would continue producing Brockway trucks and products. Mack has been forging ahead in the heavy truck field with its diesel engines and uses both its own engines and Cummins diesels and it is expected that Brockway units will also now use Mack engines. Brockway tractors have been sold with optional engine equipment in both gas and diesel engines.

Turbocharger Publication

To disseminate general and specific information on the subject of turbocharging is the purpose of the Brown Boveri Turbo-Charger News, the first issue of which is available for distribution. Each issue will discuss some specific phase of turbocharging. It is planned to publish the Turbo-Charger News on a 2-month cycle. Anyone interested in any aspect of turbocharging is welcome to be placed on the mailing list at no cost. Write Brown Boveri Corp., 19 Rector Street, New York 6, N. Y. ITS NEW

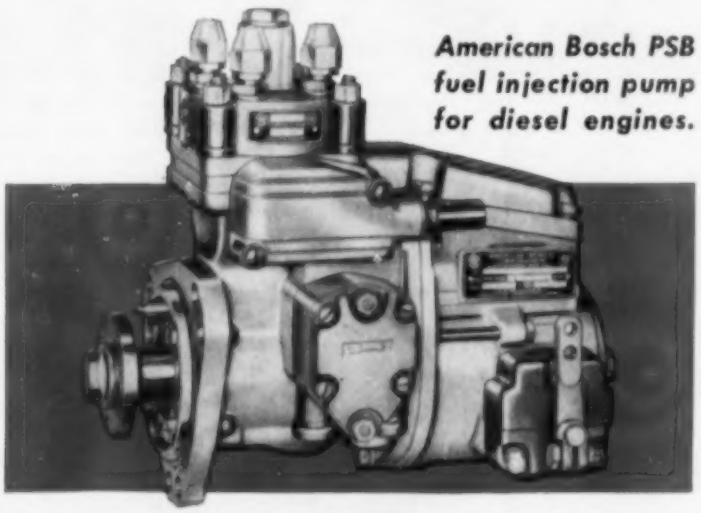
Engine Distributor

Appointment of Rogers Diesel Engineering Company, Inc., New Orleans, Louisiana as a distributor of Power Chief diesel and gas engines in the southern portions of the states of Louisiana, Mississippi and Alabama is announced by Nordberg Manufacturing Company, Milwaukee, Wisconsin. Rogers Diesel Engineering Company is actively engaged in serving oil companies, drilling contractors and the general marine field. Their expanding business has been built by providing 24 hour dependable service. Sidney F. Rogers is President of the firm. The other officers are: Clarence L. Johnson, Vice President; Wayne F. Traverse, Secretary and John M. Couvillon, Treasurer.

The offices, display floor and sales activities of the company are at 2648 Poydras Street. The shop is located on the Harvey Canal where they have 150 ft dockage for servicing marine vessels. They specialize in engine repairs and offer complete fuel injection service through their injection shop which is equipped with the latest tools and machinery. The full line of Nordberg Power Chief engines will be available from Rogers Diesel Engineering Company. It includes one, two and three cylinder diesel engines, rated 10 to 45 hp and one and two cylinder gas engines, rated 10 to 36 hp. They are furnished with stub shaft, clutch power take-off or as complete ac or dc generator units with ratings from 5 to 30 kw.

Torque Converter Bulletin

Bulletin No. 508 describing Twin Disc's new 1500 Series single-stage torque converter, has just been released by Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois. Illustrations and tables on the single-stage converter fluid circuit, horsepower and rpm capacity, and specifications are included in the bulletin. To obtain a copy of Bulletin No. 508, Series 1500, Twin Disc Single-Stage Torque Converter, write to Twin Disc Clutch Company, Hydraulic Division, Rockford, Ill. ITS NEW



American Bosch PSB fuel injection pump for diesel engines.

Unmatched for service and performance . . .

That's the record of more than 100,000 American Bosch PSB fuel injection pumps now in service—some for as long as five years. The PSB has many features—simple rugged construction, fewer parts, accurate fuel metering and distribution, positive governor control. Easily replaceable hydraulic head permits quick field servicing. All combine to assure top engine performance and economy of operation, long trouble-free life and *low* maintenance expense.

NOW . . . OWNERS OF INTERNATIONAL HARVESTER DIESELS can install the American Bosch PSB pump on their engines and enjoy its many advantages. Complete installation kits are available. For details, contact your nearest American Bosch dealer or write American Bosch, Dept. 555., Springfield 7, Mass.

AMERICAN BOSCH
Division of
American Bosch Arma Corporation
Springfield 7, Mass., U. S. A.

4096

THERE'S NO SUBSTITUTE for LUBER-FINER'S ENGINEERED PROTECTION

USE ONLY GENUINE Luber-finer DIESELPAKS

Only a Luber-finer Unit Plus a Genuine Luber-finer Pack can give the Exclusive Patented Filtering Process that has made Luber-finer The Standard of The Industry Since 1936!!

THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE—EVERY TYPE OF OIL!!

LUBER-FINER PACKS AVAILABLE

1. REFINING PACK
Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPAK
First made available in 1941, the DIESELPAK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!
The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

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Elected to Board of Directors

Walther H. Feldmann

Walther H. Feldmann, Executive Vice President of Worthington Corporation, has been elected a member of the Board of Directors of Worthington, effective September 1, Hobart C. Ramsey, Chairman, announced today. Mr Feldmann has been associated with Worthington since 1944, and has been Executive Vice President since January 1, 1955. His election to the Board increases the number of Directors to fourteen. Mr. Feldmann was born in Baltimore in 1898. After graduation from the Baltimore Polytechnic Institute, he entered the graduate student course of the Westinghouse Electric Corporation at East Pittsburgh. He served during World War I as a Naval aviator, and returned to Baltimore in December 1918, as Power Sales Engineer of the Consolidated Gas Electric Light and Power Company.

In 1922 Mr. Feldmann joined Electric Machinery Mfg. Company as Cleveland District Manager. He was appointed General Sales Manager of the company in 1927, with headquarters in Minneapolis. He became Vice President and General Manager in 1940, and President and General Manager in 1944. In May 1944 Worthington Corporation purchased Electric Machinery Mfg. Company, and Mr. Feldmann continued to serve as President and General Manager of the company until 1950. He was then transferred to the General Offices of Worthington Corporation at Harrison, New Jersey, as Vice President in Charge of Sales, and subsequently Executive Vice President. Mr. Feldmann is Chairman of the Board of Directors of Electric Machinery Mfg. Company, a registered professional engineer, and a Director of the Electrical Manufacturers Club, Baltustrol Club and the Rotary Club of New York.

FLEXIBILITY OF FORMAT

HELPS TOO

For 20 years DIESEL PROGRESS has been the Manufacturers' Magazine serving this industry. There has been no deviation—there will be none—from the high standard of featuring the finest in diesels, the best there is in major accessories and true, factual success stories on performance of diesel engines and their all-important accessories.

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Just take a look through this, or any issue of DIESEL PROGRESS, see the variety between the pages. There are no full type pages, illustrations are not only profuse, but are varied in size and shape. And, notice the variety of subject matter—all the way from marine through construction—indeed into every division of this vast diesel market.

This flexibility of format and variety of content each month adds greatly to the ease of reading DIESEL PROGRESS. Diesel men everywhere have come to know that, each month, as their copy arrives there will be something in it which they can use for profit. They also know that their reading time will be interesting and enlightening.

Are you taking full advantage of the flexibility of format to tell your full sales story in each month's issue of DIESEL PROGRESS? It's the book that is sure to be opened, just as soon as it arrives.

Mike Conway Advanced

Michael E. Conway

Michael E. Conway, Advertising Manager of the Enterprise Engine Division of General Metals Corporation, has been advanced to the position of Public Relations Director for General Metals, according to Wm. E. Butts, President. Mr. Conway will move to the Corporate Office at 220 Bush Street, San Francisco, but will continue to be responsible for the engine division's advertising program. His new duties will entail directing public relations activities for General Metals, including the Adel Division, which makes precision equipment for aircraft at its Burbank and Huntington, West Virginia plants; the Foundry and Forge Division with plants in Oakland and Vernon, California, and Houston, Texas; Pacific Fittings Division, Hollydale, California; and the Enterprise Division in San Francisco.

Off-Shore Tender

An interesting design of diesel boat has been completed for operation in the Gulf of Mexico to service the off-shore drilling operations of John W. Mecom, New Orleans, La. The boat which was designed and built by the Blount Marine Corp. of Warren, Rhode Island is of welded steel construction 64½ ft long, 21 ft wide and the draft is 6 ft. The main propulsion power is a pair of Detroit General Motors diesels, Model 6-110 and the auxiliary is a 15 kw 2-71 GM with Delco 120 volt ac generator, which furnishes service power for the ship and operates an electric galley stove and electric refrigerator.

The superstructure and exhaust stack are well forward leaving the after deck free as work space. The towing bits are almost amidships in the European manner permitting free pivoting when working in close quarters. A pilothouse of distinctive design is combined with a sheltered bridge deck and what amounts to a rear view platform

overlooking the after deck with pilot wheel and engine controls mounted on the front side of the stub stack from which the exhaust lines slant aft.

Clever utilization of the interior spaces provides comfortable quarters for the crew. This is in fact a split-level arrangement in which the quarters are carried through the main deck thus utilizing hull space to prevent top-heavy design while providing a full size pilothouse and comfortable quarters for the skipper. Luther Blount, President of the builders yard personally delivered this boat in convoy with another of his construction to New Orleans owners. He followed the inside passages en route.

CBE Trucks Added To Fleet

Buckingham Transportation, Inc., continues to build the efficiency of its fleet of Flying-B trucks by adding 40 new Kenworth Cab-Beside-Engine trucks to its large fleet. Earl Buckingham, president, announces the new Kenworths have arrived at various Buckingham terminals and all are now in service. Purchase of the new Kenworth Model 523 CBE's represents an investment of approximately $800,000 and is in line with the Buckingham policy of insuring the safety of its drivers with the finest modern equipment. Buckingham's outstanding record of safety over-the-road is due in great part to its unusually high personnel cooperation, according to President Buckingham, who believes company emphasis on keeping equipment at a high standard is an important factor.

The 26-year-old Buckingham Transportation organization has grown from a one-truck business, established May 1, 1930, to a vast, Class I common carrier trucking company serving some 39 cities with more than 500 vehicles. Buckingham Transportation, Inc., has main terminals in Omaha, Minneapolis-St. Paul, Billings, Winnipeg and Denver. General offices and the headquarters terminal are located at Rapid City, South Dakota. Other terminals in the Buckingham trucking empire include Miles City and Glasgow, Montana; Carrington, Williston, Fargo, Bismarck, Grand Forks, Garrison, Minot, Jamestown, Portal and Devils Lake, North Dakota; Spearfish, Custer, Sturgis, Hot Springs and Igloo, South Dakota; Casper, Gillette, Lusk, Newcastle and Sheridan, Wyoming; Detroit Lakes and Crookston, Minnesota; and Chadron, Nebraska.

The 40 newest Kenworths in the Flying-B fleet all are 523 CBE's with sleeper cabs. Dry chassis weight is 13,260 lbs each. Road ready, including driver, relief driver, fuel, tools and fifth wheel, the chassis weight is 15,060 lbs. To operate in states allowing 64,650 lbs gross combined weight, these Kenworth trucks have an approximate pay load capacity of 39,500 lbs each. The trucks are operated in combination with 35 ft semi-trailers in states limiting overall length to 45 ft. Measuring 94½ in. from bumper to the back of the cab, Buckingham Transportation's new CBE's with sleeper cab have a wheelbase of 158 in. providing a 91½-in. dimension from cab to rear axle. The custom-engineered trucks have heat-treated steel frames and steel disc wheels. They are powered with Cummins HRFB 180 hp diesel engines. Each truck has two 65 gal. aluminum fuel tanks.

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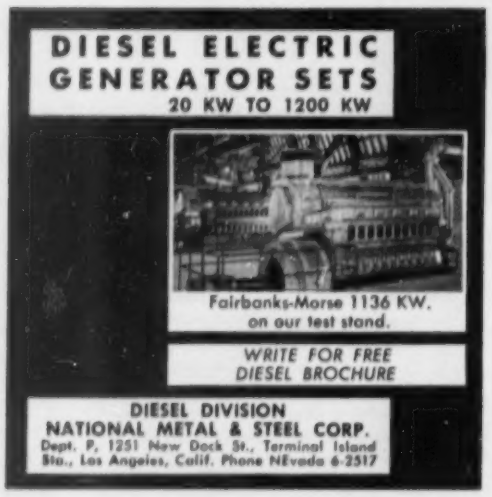

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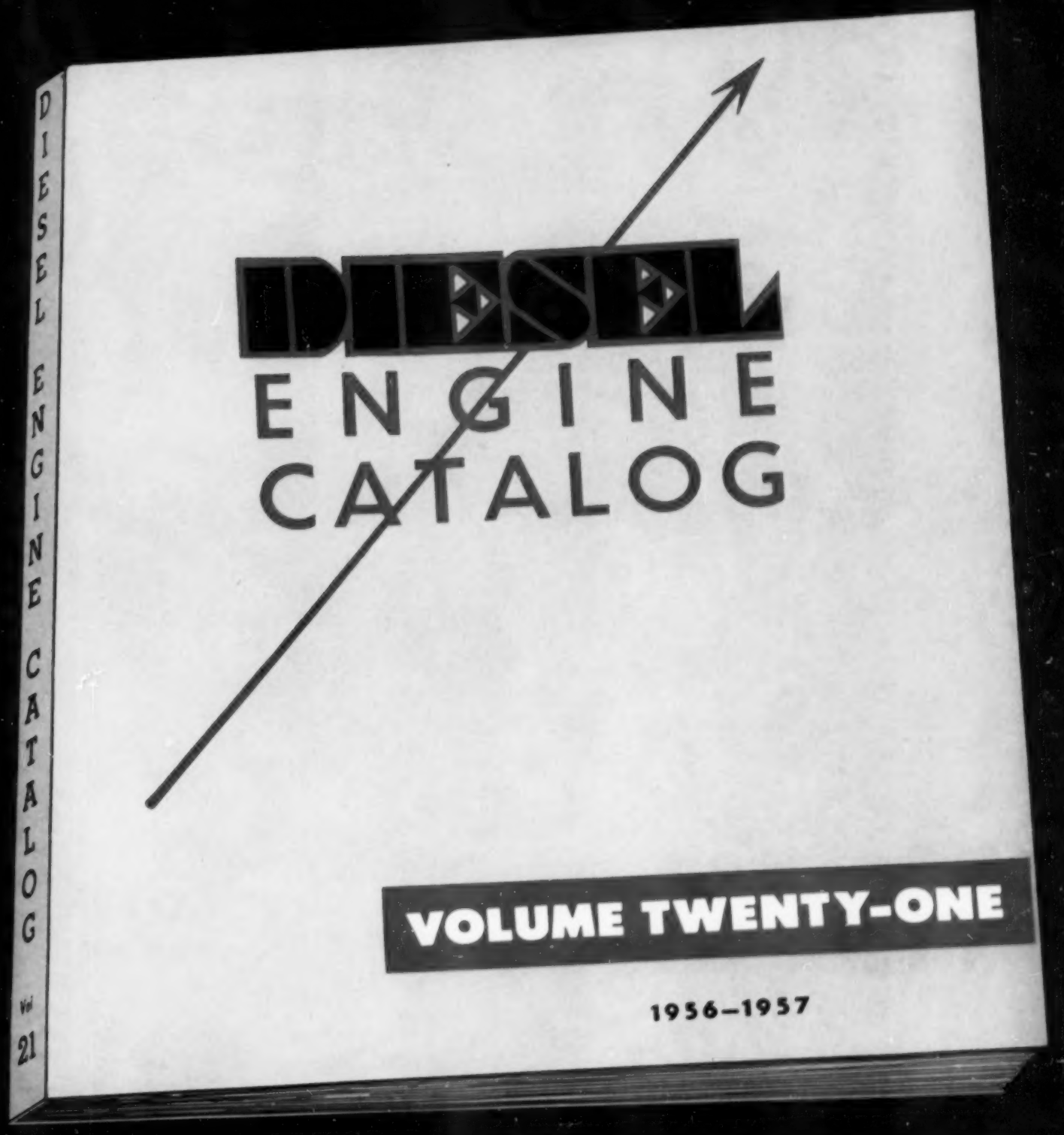

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